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Engineer's Report

Prepared by

Santa Clara Valley Water District

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LOWER GUADALUPE RIVER PLANNING STUDY

ENGINEER'S REPORT

PROJECT NO. 3015

REGISTERED PROFESSIONAL ENGINEER
DAVID MICHAEL VON RUEDEN
C 26428
EXP. 3-31-04
CIVIL
STATE OF CALIFORNIA

Engineer's Report Prepared by CH2M HILL, Inc., under the Direction of

Nai Hsueh, P.E.	Deputy Operating Officer
Dennis Cheong, P.E.	Senior Project Manager

(Environmental Impact Report — Bound Separately)
Prepared by
Jones & Stokes Associates, Inc.

Walt Wadlow	Dave Chesterman
Chief Operating Officer	Guadalupe Watershed Manager

August 2001

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ACKNOWLEDGEMENTS

This document was prepared with assistance from:

Santa Clara Valley Water District:

Dave Chesterman	Guadalupe Watershed Manager
Walt Wadlow	Chief Operating Officer
Nai Hsueh, P.E.	Deputy Operating Officer
Dennis Cheong, P.E.	Senior Project Manager
Belinda Allen	Senior Project Manager
Saeid Hosseini, P.E.	Associate Civil Engineer
Afshin Rouhani, P.E.	Associate Civil Engineer, Hydrology
Ken Reiller, P.E.	Associate Civil Engineer, Maintenance
Mohammad Khan, P.E.	Senior Engineer, Geotechnical
Merna Leal	Project Assistant
Brooke Bayne	Project Assistant
Laura Krutul	Project Assistant
Bobbi Gee	Project Coordinator
Jim Wang, P.E.	Unit Manager, Hydrology
Steven Choi	Surveyor
Terry Neudorf	Environmental Planner
Shola Idowu	Associate Civil Engineer, Hazmat
Randall R. Talley, P.E.	QA/QC Manager

Consultant Team:

CH2M HILL, Inc.

David Von Rueden, P.E.	Senior Project Manager
Ben Everett, P.E.	Assistant Project Manager/QA/QC Lead
Erika Gomez	Lead Project Engineer
John Rogers, P.E.	Project Engineer
Thomas Jacques	Design Engineer
Tim Hayes, P.E.	Civil Engineer
Nader Tamannaie, P.E.	Structural Engineer
Jay Aldean	Hydraulic Engineer
Jorge Monroy	Lead CADD Technician
Nancy Michels	Graphic Designer
Chris Proud	Public Outreach Specialist
Connie Eichhorn, P.E.	Public Outreach Specialist
Carol Lewis	Project Assistant
Angela Jacobson	Lead Editor
David Roy	Editor
Kristi Howard	Document Processor
Jay Johnson	Cost Estimator
Bob Lawson	Cost Estimator

Jones & Stokes Associates, Inc.

Alan Solbert	Principal-In-Charge
Steve Centerwall	Project Management
Barbara Rocco	Project Coordinator/Hazardous Materials, Public Utilities
Simon Page	Project Coordinator/Hydrological and Hydraulic Conditions, Geomorphology, Water Quality
Keith Casey	Fisheries Biology
Jeff Kozlowski	Fisheries Biology Peer Review
Harry Oakes	Vegetation and Wildlife
Kate Giberson	Land Use and Planning, Recreation Public Access, and Visual Resources Peer Review
Wendy Young	Land Use and Planning, Recreation Public Access, and Visual Resources
David Zippin	Reconnaissance Study and Interim O&M Investigation
Kevin Lee	Air Quality and Noise
Ray Weiss	Transportation and Traffic
Trish Fernandez	Cultural Resources Peer Review
Barbara Siskin	Cultural Resources
Gregg Roy	Cumulative Impacts
Julie Nichols	Lead Editor
Andreis Morais	Assistant Editor
Debbie Jew	Communications Specialist
Bev Fish	Production

Northwest Hydraulic Consultants Inc.

Robert MacArthur, P.E.	NHC Team Leader
Jeff Johnson, P.E.	Project Manager
Loren Murray, P.E.	Technical Leader for Bayland Reconnaissance Study
Brad Hall, P.E.	Technical Leader for Sediment Transport
Ed Zapel, P.E.	Technical Leader for Hydraulic Design
Richard Regan, P.E.	QA/QC Lead
Jim Lencioni, P.E.	QA/QC Lead
Lisa Larson, P.E.	Hydraulic Designer
Robert Elliot, P.E.	Hydraulic Modeler
Peter McCann, P.E.	Hydraulic Modeler
Robert Odell	Hydraulic Modeler
Lea Adams, P.E.	Hydraulic and Sediment Transport Modeler
Steve Seville, P.E.	Hydraulic and Sediment Transport Modeler
Marjorie Caisley	Hydraulic and Sediment Transport Modeler
Eric VanderMeer	CADD Technician

H.T. Harvey & Associates

Ronald R. Duke, M.A.	Principal
Eric Webb, Ph.D.	Restoration Ecologist
Gail Seeds, B.S.C.E.	Senior Project Manager
Scott Terrill, Ph.D.	Wildlife Biologist
Thomas Ryan, M.S.	Wildlife Biologist
Andrew Dilworth, B.S.	Plant Ecologist
Brian Cleary, M.S.	Botanist

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ACRONYMS AND ABBREVIATIONS LIST

ABA	Architectural Barriers Act
ac	acre
ACM	articulated concrete mattress
ADA	Americans with Disabilities Act
af	acre-feet
Bay	San Francisco Bay
BMP	best management practice(s)
B.P.	before present
Caltrans	California Department of Transportation
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CIP	capital improvement project
cm	centimeter
cms	cubic meter per second
Corps	U.S. Army Corps of Engineers
County	Santa Clara County
CPRU	Community Projects Review Unit
CVP	Central Valley Project
CWA	Clean Water Act
CZARA	Coastal Zone Act and Reauthorization Amendments
District	Santa Clara Valley Water District
Downtown Project	Corps' Downtown Guadalupe River Project
EIR	environmental impact report
EIS	environmental impact statement
EOP	Emergency Operations Plan
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FAHCE	Fisheries and Aquatic Habitat Collaborative Effort
FEMA	Federal Emergency Management Agency
fps	feet per second
ft	foot or feet

g	gram
GIS	geographic information system
GRR	Guadalupe River Report
Guad 104	study segment of the Guadalupe River
ha	hectare
I-280	Interstate 280
I-880	Interstate 880
ICID	illicit connection and illegal dumping
in	inch
IND	industrial and commercial discharges control
km	kilometer
km^2	square kilometer
km^3	cubic kilometer
LCA	Local Cooperative Agreement
LGRP	Lower Guadalupe River Project
m	meter
m^2	square meter
m^3	cubic meter
MBTA	Migratory Bird Treaty Act
MCE	maximum credible earthquake
MET	metal control measure
mi	mile
mi^2	square mile
mi^3	cubic mile
M_L	local magnitude
mm	millimeter
MMP	mitigation monitoring plan
MOU	memorandum of understanding
mps	meters per second
MSE	mechanically stabilized earth
MSHCP	Multiple Species Habitat Conservation Plan
M_W	moment magnitude
mya	million years ago
NAVD	North American Vertical Datum
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NHC	Northwest Hydraulic Consultants
NHI	Natural Heritage Institute
NHPA	National Historic Preservation Act

NMFS	National Marine Fisheries Service
NOP	Notice of Preparation
NPDES	National Pollution Discharge Elimination System
NRHP	National Register of Historic Places
O&M	operations and maintenance
OSHA	Occupational Safety and Health Act
PAA	public agency activity(s)
PGA	peak horizontal ground acceleration
PI/P	Public Information/Participation Program
ROW	right-of-way
RWQCB	Regional Water Quality Control Board
SE/NW	southeast and northwest
sec	second
SMP	Stream Maintenance Program
SRA	shaded riverine aquatic
SWID	stormwater infiltration device
SWP	State Water Project
SWPPP	Stormwater Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TCE	temporary construction easements
UPRR	Union Pacific Railroad
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VTA	Santa Clara Valley Transportation Authority
WGCEP	Working Group on California Earthquake Potential
WGNCEP	Working Group on Northern California Earthquake Potential
WMI	Watershed Management Initiative
WMM	Watershed Management Measures
WSE	water surface elevation
y^3	cubic yard
yr	year

GLOSSARY OF TERMS

ambient – Existing or background (e.g., ambient conditions). Commonly used to describe existing air, soil, water, or habitat conditions in a given area.

banks – The slopes of an active channel, between which streamflow is normally confined.

bank erosion – Removal of sediment and soil particles from a bank slope, primarily by the action of running water. Climate, ice and debris, chemical reactions, and changes in land and stream use may also contribute to bank erosion.

bank stabilization structures – Feature installed or constructed to reduce bank erosion.

bar – A deposit of sediment (boulders, gravel, sand, and mud on the bed of a stream), typically formed and modified at high flow and exposed at low water.

bed – The floor of a streamchannel or other body of water.

Best Management Practices (BMPs) – Practices implemented to prevent or reduce potential impacts common to construction. BMPs may include operations and maintenance procedures, construction-site housekeeping requirements, schedules, schedules of activities, and prohibition of certain practices.

California Environmental Quality Act (CEQA) – State legislation that established environmental for California. CEQA provides an interdisciplinary framework for state agencies to prevent environmental damage by ensuring that decision makers take environmental factors into account when approving projects.

channel – A natural or artificial feature that conveys water.

channel relocation – Excavation and grading to move the active channel of a stream to another location.

Clean Water Act – Formally known as the Federal Water Pollution Control Act; the basic water pollution control statue for the United States.

cumulative impact – The effect of two or more individuals impacts that, when considered together, are considerable, or that compound or increase other environmental impacts. The individual impacts may be changes resulting from a single project or two from two or more separate projects.

direct impact – Primary environment effect resulting from construction or operation of a project and occurring at the same time and place.

Endangered Species Act of 1973 – Federal law that protects plant and animal species in danger of extinction.

Environmental assessment (EA) – A public document prepared in compliance with the National Environmental Policy Act to evaluate the significance of the impacts likely to result from a proposed action (project) and to determine whether an environmental impact study (EIS) is required.

environmental compliance – The process necessary to comply with federal, state, and local environmental laws and regulations.

environmental impact report (EIR) – A detailed written statement prepared in compliance with the California Environment Quality Act, describing and analyzing the environment impacts of a proposed project, and discussing ways to mitigate or avoid those impacts.

environmental impact statements (EIS) – A detailed written statement, prepared in compliance with Section 102(2)(c) of the National Environmental Policy Act, describing and analyzing the environmental impacts of a proposed action (project), and discussing ways to mitigate or avoid those impacts.

erosion – Strictly speaking refers to the removal of sediment, soil, or other surface material from a landscape surface (e.g., hillside, streamback, or streambed) by the scouring action of turbulent water. Sometimes used informally to refer the collective action of water, wind, and ice to "wear away" a landscape over time.

flood conveyance capacity – The ability of a channel to carry or move floodwaters.

floodplain – Land adjacent to a streamchannel, at or above the elevation of bankfull discharge. The floodplain typically consists of a flight of several benches or terraces with progressively higher elevations flanking the active channel. Benches at lower are elevations are typically inundated about 2 of 3 years on average; higher-level benches are inundated only in larger flood events that recur on a longer cycle (10-100 years). The floodplain develops as sediment is deposited by warning floodwaters.

floodplain development – Natural processes of flooding and sediment deposition that contribute to the growth of the floodplain.

freeboard – The distance between the design flow water surface elevation and lowest point of the section at which water would overflow.

geomorphology – The branch of earth sciences that deals with the shape and development of landforms.

groundwater – Water is subsurface soil and rock materials, from which wells are supplied. In unconsolidated or loosely consolidated materials (such as soil or porous sedimentary rocks), groundwater occupies spaces between grains. In hard, consolidated materials (such as granite, metamorphic rocks, or "tight" sedimentary rocks), groundwater occupies fractures or cracks.

habitat – The environmental context in which an animal or plant normally lives, among its associated species.

hazardous materials – Raw materials and products that (because of their quantity, concentration, or physical or chemical characteristics) pose a significant present or potential danger to human health and safety or to the environment, if released.

hydraulics – The engineering subdiscipline that addresses the flow of water and other fluids, including the practical effects and control of moving water. Also refers to the relationship between channel geometry, flow velocity, and depth of water in a natural or artificial channel.

impact – A change in environmental conditions that results from implementing or operating a project (CEQA) or action (NEPA).

inchannel – Instream; within the channel or wetted portion of a streambed.

indirect impact – Secondary environmental effect resulting from construction or operation of a project; removed in or space from the project.

infiltration – Movement of rainwater or surface runoff downward into subsurface soils, sediments, and rock. Infiltration is typically a major source of groundwater recharge in areas with permeable surface materials.

initial study (IS) – A public document prepared in compliance with the California Environmental Quality Act to evaluate the significance of the impacts likely to result from a proposed project and to determine whether an environmental impact report (EIR) is required.

instream – Inchannel; within the channel or wetted portion of a streambed.

lead agency – The public agency that has the principal responsibility for carrying out or approving a proposed project.

levee – A natural or artificial embankment along a river. The term levee is generally applied when the riverbank rises above the level of the adjacent floodplain. Some natural streams, especially those with low gradients and meandering channels, have naturally aggraded levees. In some places, such as the Sacramento River delta region, levees are built up artificially as a means of enhancing flood protection.

low-flow channel – A narrow channel within a streambed that confines a streamflow during periods of low water volume, reducing water stagnation at low flow and thus decreasing channel siltation and improving both water quality and habitat values. A constructed low-flow channel is roughly analogous to the thalweg, or deepest portion, of a natural stream channel.

maintenance – The activities necessary to ensure that the elements of a project continue to operate properly after construction. In the habitat restoration context, includes activities that ensure the successful establishment of restoration plantings, including but not necessarily limited to weeding, thinning, irrigation, and exotic species control.

mitigate – To moderate, reduce, or alleviate the impacts of a proposed activity. May include: (a) avoiding the impact by not taking a certain action or an action; (b) minimizing the impact by limiting the degree or magnitude of the action and its implementation; (c) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (d) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and/or (e) compensating for the impact by replacing or providing substitute resources or environments.

mitigation – Refers to the act of mitigating, or to measures or features designed to mitigate.

National Environmental Policy Act (NEPA) – Federal legislation that established environmental policy for the nation. NEPA provides an interdisciplinary framework for federal agencies to prevent environmental damage and contains "action-forcing" procedures to ensure that federal agency decision makers take environmental factors into account.

100-year flood – A flood that has a 1% chance of equaling or exceeding 17,000 cubic feet per second in any given year.

peak flow – The maximum discharge (flow volume) of a stream during a specified period of time.

reach – A section, segment, or portion of a stream's length.

recharge – Replenish of groundwater reserves, typically by infiltration, or percolation of surface water downward through permeable surface materials into the subsurface.

responsible agency – A public agency that proposes to carry out or approve a project for which a lead agency has prepared an environmental impact report.

riparian – Pertaining to the banks of a river, stream, waterway, or other flowing body of water, as well as to plant and animal communities along such bodies of water.

runoff – The portion of precipitation (rainfall or snowmelt) that remains on the ground surface and enters the surface water system rather than percolating into the subsurface.

sediment – Generally used to refer to particles physically broken down and transported from their source by the action of water, ice, or wind. Strictly defined, sediment also includes components dissolved from a parent rock source and carried in solution by surface water and groundwater.

sediment deposition – The accumulation of boulders, gravel, sand, and mud on the streambed, streambanks, and floodplain.

sediment load – The amount of material a stream is carrying at a given time.

sedimentation – The process by which sediments settle out of water.

shaded riverine aquatic (SRA) – Refers to emergent riparian vegetation that overhangs a streamchannel. One important function of SRA cover vegetation is to shade the water in the channel, helping to maintain cooler water temperatures, and thereby improving habitat for native coldwater fish such as steelhead and chinook salmon. SRA cover also provides a source of inchannel plant material, including leaf litter (used by shredding insect species) and woody material (an important source of cover for fish).

special-status species – Includes plant, fish and wildlife species that are listed, proposed for listing, or candidates for listing as threatened or endangered under the federal or California

Endangered Species Act; also include plant species that are listed by the California Native Plant Society.

upland habitat – Habitat in areas not subject to flooding.

water table – An imaginary underground surface below which subsurface materials (soil, rock, etc.) from erosion except at flood stage.

watershed – The area that drains or contributes surface water to a stream, lake, or other body of water.

weir – A dam, wall, or other structure in a waterway for the purpose of storing, diverting, screening, or measure water.

wetland – Land transitional between terrestrial and aquatic regimes (e.g., marshes, intertidal mudflats, and wet meadows), where the table is typically at or near the surface, or the ground is covered by shallow water. Wetlands include freshwater, brackish, and saltwater areas.

PREFACE

The Santa Clara Valley once supported extensive riparian vegetation along the creeks in the Guadalupe River Watershed. The banks of the stream, prone to overbank flooding, supported a diverse and biologically rich habitat. After development began in the valley, the overall extent and condition of riparian vegetation and the habitat value of the creek environment changed because of the alteration of the stream banks through man-induced and material processes. The floodplain and high terraces of the river, once dominated by riparian habitat, have been converted to urban development. The several linear miles of remaining riparian vegetation are broken into a discontinuous and narrow riparian corridor. Activities associated with urban development such as leaking underground storage tanks, industrial spills, land alteration, urban runoff, and nonpoint source pollution have the potential to degrade the water quality in the Guadalupe River Watershed. Flooding is also a major problem in the watershed. Accounts of flooding from the Guadalupe River date back to 1777, when San Jose was established as a Spanish pueblo. More recent significant floods have occurred in 1955, 1958, 1980, 1982, 1986, and 1995 (SCWVD 1999).

The Engineer's Report presents the water resource-related problems in the lower river reaches of the Guadalupe River Watershed. Watersheds are the most logical areas at which actions should be taken to restore and protect water resources as most natural events and economic activities affect the quality of water resources principally within watershed boundaries. Various ongoing integrated water resources management programs, led by the Santa Clara Valley Water District and by others, in the watershed address water resource related problems.

A multi-objective capital improvement project on the Lower Guadalupe River, between the Union Pacific Railroad and Interstate 880 is recommended. Based on the District's integrated water resources planning process, a variety of alternatives that would best satisfy all the objectives of the District were evaluated. Each alternative was assessed for effectiveness in addressing problems and minimizing impacts on riparian vegetation, wetland, wildlife habitat, fisheries, water supply, local drainage, aesthetics, and recreation. To ensure all concerns were addressed, the recommended alternative was developed in close coordination with the City of San Jose, City of Santa Clara, Santa Clara County Parks and Recreation Department, Caltrans, San Jose International Airport, and citizens residing in or owning property in the floodplain of the river. The recommended project was chosen from among all alternatives because it would best protect the community from the design flood, improve water quality in the river, solve erosion problems, improve maintenance access, reduce sedimentation problems, provide continuous fish passage to upstream habitat, potentially facilitate a continuous riparian corridor for wildlife, and increase recreational development potential, which complement the county-wide park and trail master plan.

The Engineer's Report is prepared in accordance with the Santa Clara Valley Water District Act, which directs the preparation of plans for a project and reports to be filed with the board. The report also complies with the California Environmental Quality Act, which requires an Environmental Impact Report for any project that may have significant impacts. On the basis of the initial study on the capital improvement project, it was found that the recommended capital improvement project may have significant effects on the environment, and therefore an Environmental Impact Report is required.

CHAPTER 1
SUMMARY

The Lower Guadalupe River Engineer's Report presents the existing water resource-related problems in the Lower Guadalupe River, from Union Pacific Railroad (UPRR; formerly Southern Pacific Railroad) to Interstate 880 (I-880), including water quality and potential flooding. The report includes the results of an investigation of the existing and potential flooding, erosion, and sedimentation problems on the Lower Guadalupe River between I-880 and the community of Alviso, a distance of approximately 10.46 kilometers (km; 6½ miles [mi]). The report includes a discussion of the alternative solutions analyzed, and a recommended capital improvement project. The Environmental Impact Report (EIR), bound separately from this Engineer's Report, contains a discussion of the environmental impacts of, and mitigation for, the evaluated alternatives and the recommended project.

Public hearings will be held on the Engineer's Report and EIR and comments will be solicited from the community and responsible agencies. The Santa Clara Valley Water District (District) Board of Directors will then decide what action, if any, to take.

1.1 Project Background

The District signed a Local Cooperative Agreement (LCA) with the U.S. Army Corps of Engineers (Corps) in March 1992, whereby the District agreed to operate and manage the Lower Guadalupe River to provide the Corps' design flood flow capacity when the Corps' flood control project in downtown San Jose is completed, currently expected in 2004. This Engineer's Report was initiated after the discovery of inadequate capacity to carry the design flood flow in the Lower Guadalupe River, as indicated from the 1995 storm events.

The Guadalupe River, from the UPRR in Alviso to Highway 101 was constructed in 1983 to provide the Corps' design flood flow capacity. Based on the data collected from the January and March 1995 storm events, a hydraulic analysis showed that the planned flood capacity was not currently provided. Both sediment deposition and vegetation growth were identified as the main causes of reduction in channel capacity.

In the spring of 1995, an emergency project team was assembled to investigate options to restore the flood capacity in the Lower Guadalupe River in the interim before a comprehensive multi-objective planning study and capital improvement project could be completed. An interim levee restoration project was constructed in the summer of 1995 to carry the Corps'design flood flow, with 50 percent of the design freeboard.

As a parallel, but independent, activity, the Guadalupe River Watershed Planning Study was initiated to evaluate water quality and flooding problems in the watershed. The Planning Study recommended a multi-objective capital improvement project for the Guadalupe River, between

Highway 101 and I-880, and from Interstate 280 (I-280) to Blossom Hill Road. The Guadalupe River Watershed Planning Study is scheduled to go to the District Board of Directors for approval in August 2001.

Another multi-objective capital improvement program in the Guadalupe River Watershed, the Corps' Downtown Guadalupe Project (Downtown Project) has been underway since the early 1990s. The Corps is the Downtown Project proponent, with the District as the local sponsor. The project is located immediately upstream from the Lower Guadalupe River Project (LGRP), between I-280 and I-880, and once completed, will effectively convey the peak flows from the upper watershed to the Lower Guadalupe River. Contracts 1 and 2 of the Downtown Project have been completed. Contract 3, the final project element, is scheduled for completion by the end of the year 2004, which requires that the Lower Guadalupe River be able to convey the Corps design flood flow through the lower reaches of the river to San Francisco Bay, by that same time. Not meeting this requirement would jeopardize the Downtown Project schedule and violate the 1992 LCA with the Corps.

As a mitigation measure for the Downtown Project, shaded riverine aquatic (SRA) habitat plantings have been planted in the Guadalupe River downstream from I-880. The hydraulic impacts of this planting were not evaluated in the Guadalupe River Watershed Planning Study. Coincidentally, other recent activities in this portion of the river, identified as Reach A, including construction of State Route 87 along the east river bank and implementation of the San Jose International Airport Master Plan on the west bank, necessitated additional study. Reach A, therefore, has been included in this Engineer's Report. Results and recommendations from the separate Guadalupe River Watershed Planning Study relative to Reach A are incorporated into this Engineer's Report. Figure 1-1 is the Guadalupe River Watershed, which shows the relationship of the various projects described above.

The Engineer's Report has been prepared in conformance with the LCA between the District and the Corps to ensure that the channel improvements are operated and managed to convey design flood flows from I-880 to San Francisco Bay. Design conditions, as defined by the Corps LCA, and the Interim Operation and Maintenance Manual, are to "contain the one percent-design flood with a peak flow of 481 cubic meters per second (cms; 17,000 cubic feet per second [cfs])" with a minimum 1.07 meters (3.5 feet [ft]) of freeboard along the levees (to meet Federal Emergency Management Agency [FEMA] guidelines) and 1.22 m (4 ft) at bridges, as required in the District Engineering Policies and Procedures.

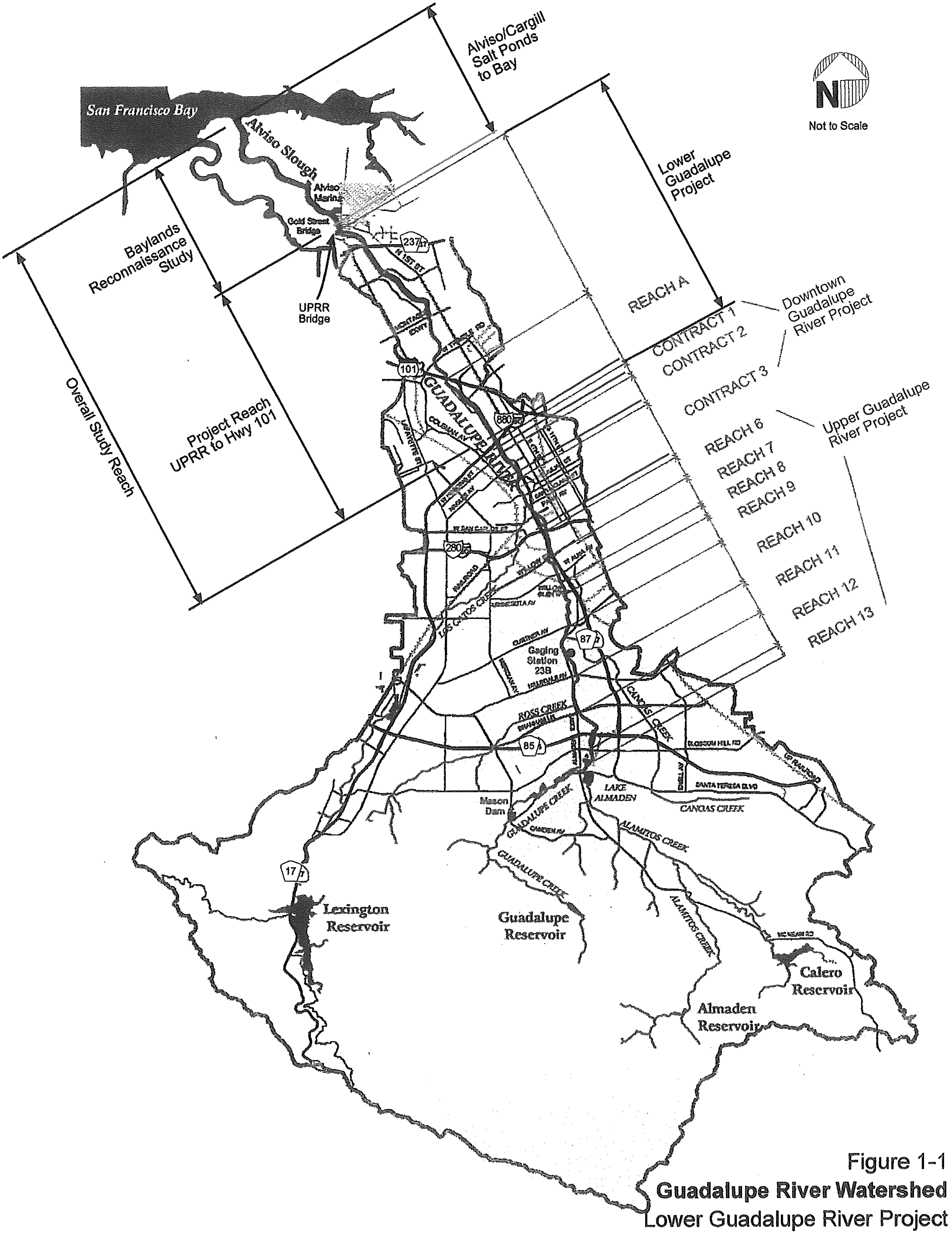

Figure 1-1

Guadalupe River Watershed

Lower Guadalupe River Project

Base map provided by Santa Clara Valley Water District.

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1.2 Purpose of the Engineer's Report

The Engineer's Report has been prepared in accordance with Section 10 of the District Act, which was initiated after the discovery of inadequate capacity to carry the design flood flow in the Lower Guadalupe River, as indicated from the 1995 storm events. The report includes the following:

- Related projects, programs, and regulations (Chapter 1)
- Watershed description and project background (Chapters 2 and 3)
- Formulation of project alternatives (Chapter 4)
- Recommended project (Chapter 5)
- Description of the proposed maintenance program (Chapter 6)
- Project cost, funding, and schedule (Chapter 7)
- Conclusions and recommendations (Chapter 8)

In addition to the Engineer's Report, an EIR has been prepared to address potential environmental effects of the LGRP. The EIR contains a more detailed discussion of the environmental impacts of the proposed project and proposed mitigation measures. The EIR will support decision making by the District, the Corps, and other responsible and cooperating agencies to implement the project and ensure compliance with the California Environmental Quality Act (CEQA), and other pertinent laws and regulations. The EIR is bound separately from this Engineer's Report.

1.3 Study Overview

The Engineer's Report provides the engineering support for the LGRP EIR. Flood protection measures proposed for Guadalupe River, between I-880 and the UPRR in Alviso, and the conditions before and after these improvements, are presented in this study.

For project planning purposes, the LGRP has been divided into eight reaches to simplify consideration of construction elements and discussion of environmental impacts. The eight reaches are as follows:

- Reach A: I-880 to Highway 101
- Reach B: Highway 101 to Trimble Road
- Reach C: Trimble Road to Montague Expressway
- Reach D: Montague Expressway to the Hetch Hetchy Aqueduct
- Reach E: Hetch Hetchy Aqueduct to Tasman Drive
- Reach F: Tasman Drive to Route 237

- Reach G: Route 237 to the UPRR Bridge in Alviso
- Alviso Baylands Area

Figures 1-1 and 1-2 illustrate the Guadalupe River Watershed, and show the project divided into Reaches A through G and the Alviso Baylands Area, respectively. A multi-objective capital improvement project is recommended for the project area. The LGRP is part of the Integrated Water Resources Management Program in the Guadalupe Watershed, which was created to address water resources-related problems along the length of the Guadalupe River, from its source in the Santa Cruz Mountains to the San Francisco Bay.

A variety of alternatives would satisfy the objectives of the District and affected communities. Each alternative was assessed for its effectiveness in addressing flood protection and its impacts on riparian vegetation, wetlands, wildlife habitat, fisheries, water quality, local drainage, aesthetics, and recreation. The project design concepts evaluated during the planning process include No Project alternative, Non-Structural alternative, Upstream Floodwater Storage alternative, Fluvial Geomorphological alternative, Change in Upstream Reservoir Operations alternative, Watershed Transfer alternative, Off-Stream Storage Basin alternative, New Channel Construction alternative, Channel Modification alternative, and Channel Bypass alternative. Chapter 4, Formulation of Alternatives includes a summary and description of the design concepts that were evaluated through an alternative screening process.

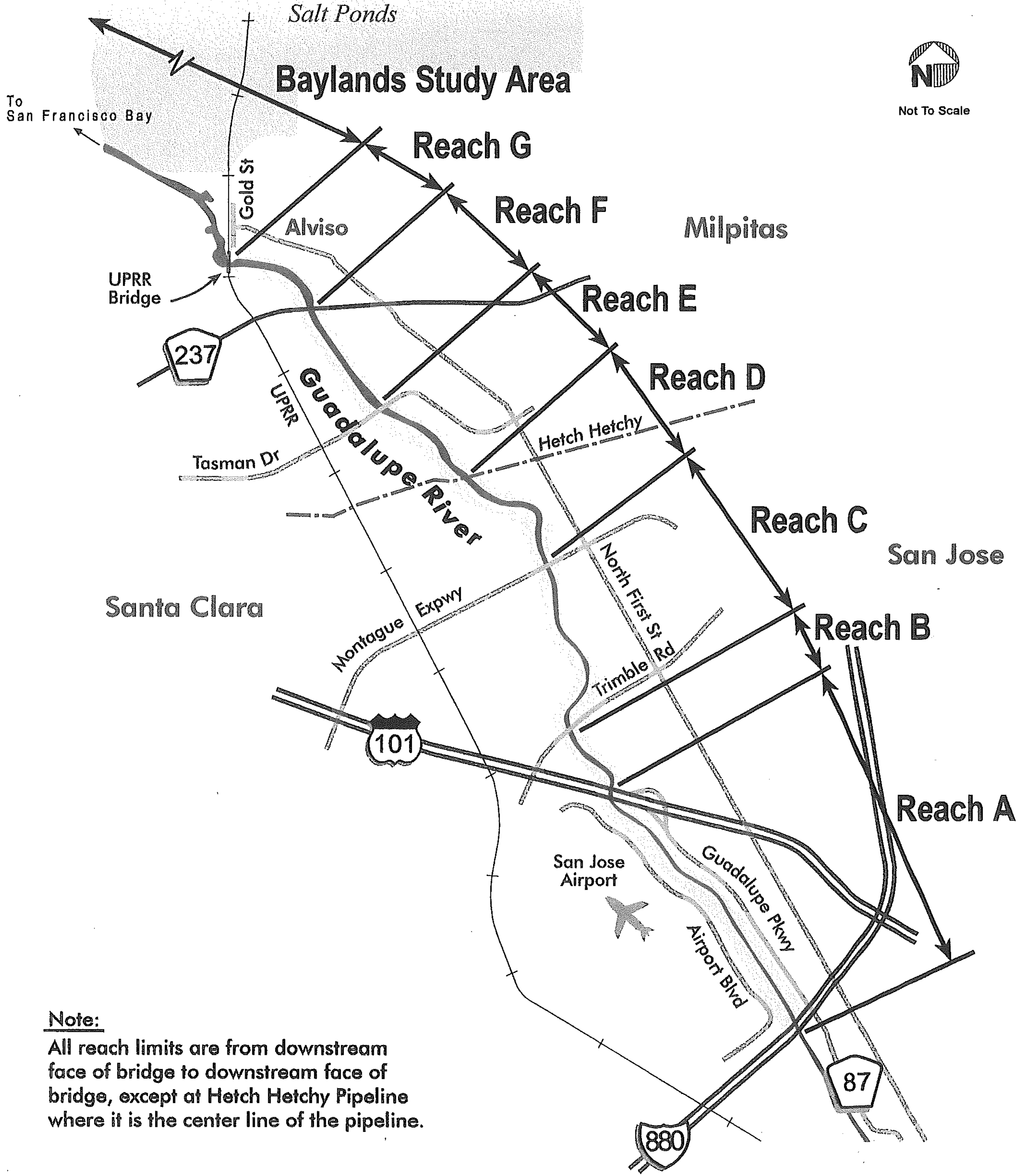
1.4 Goals and Objectives of the District

The District is the water resource management agency serving the flood protection and wholesale water supply needs of Santa Clara County's (County) 1.6 million residents. The goal of the District is to provide a supply of water, adequate in both quantity and quality, that meets the desired quality of life in the community; protects against flooding in a manner that maintains the desired quality of life in the community; and coordinates with other community water-related programs to achieve full water management. These goals are met through a series of objectives that direct the activities of the District.

1.4.1 General Objectives

The District's general objectives are as follows:

- Consider the desires of the community in all District programs and projects
- Protect the environment and the economic well-being of the community in the formulation and execution of District programs and projects
- Provide environmental impact mitigation measures, such as revegetating District projects, as appropriate



Note:
All reach limits are from downstream face of bridge to downstream face of bridge, except at Hetch Hetchy Pipeline where it is the center line of the pipeline.

Legend:

▨ Project Area

Figure 1-2
Reaches A-G and Baylands Study Flood Control Project Area
Lower Guadalupe River Project

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1.4.2 Water Supply Objectives

The District's water supply objectives are as follows:

- Optimize conservation of all water resources
- Ensure optimal primary usage of local water resources with adequate importation of supplemental supplies
- Plan for alternative supplemental water supplies, where feasible, including reclamation of wastewater
- Preserve and protect the local watersheds and groundwater basin
- Preserve and enhance water quality, both surface and underground

1.4.3 Flood Damage Reduction Objectives

The District's flood damage reduction objectives are as follows:

- Provide flood protection by management of the natural floodplain or of a modified floodplain, using the more structural types of channelization only where other measures are impractical
- Give priority to protection against flooding of developed areas, with the areas of greatest potential damage having the highest priorities
- Encourage proper controls to prevent incompatible land uses in areas subject to flooding
- Discourage future land use practices which will subject existing urban areas to additional flooding
- Ensure that flood control measures taken to assist an area shall not induce flooding upon any other area
- Maintain District facilities to ensure they continue to provide the level of flood protection for which they were constructed, both to protect the public's investment and to comply with regulations of the federal flood insurance program
- Protect, enhance, or restore watersheds, streams, and the natural resources, when appropriate
- Protect, enhance, or restore healthy creek and bay ecosystems, as determined appropriate by the Board
- Encourage additional open spaces, trials, and parks along creeks and in the watersheds when reasonable and appropriate

1.4.4 Project Objectives

The following primary objectives were used to develop alternative plans for the LGRP. All of the proposed action alternatives must be considered consistent with the project objectives.

- Provide channel capacity in the Lower Guadalupe River to safely carry the floodwaters to be contained by the Corps Downtown Guadalupe River Project (Downtown Project) in accordance with the terms of the Corps LCA
- Reduce bank erosion and sedimentation related impacts along the Lower Guadalupe River
- Avoid potential adverse impacts on fish and wildlife habitats
- Minimize impacts to the river's environmental resources and restore some of the lost historic functions and value of the riparian corridor where feasible
- Provide long-term riparian habitat improvement to offset impacts that result from the construction of flood protection facilities
- Provide mitigation for unavoidable adverse impacts on environmental resources
- Provide opportunities to protect and enhance the existing wetlands and riparian habitat, and improve conditions favoring Chinook salmon and Steelhead trout
- Provide, wherever possible, a continuous maintenance access along the river which can be used as a trail
- Identify potential project impacts on Alviso and bayland areas and mitigate for unavoidable adverse impacts
- Specify Best Management Practices (BMPs) to protect water quality

1.5 Problem Definition

The Guadalupe River is located in the Districts' Central Flood Control Zone. The upper watershed is located in the eastern Santa Cruz Mountains near the summit of Loma Prieta. The Guadalupe River begins at the confluence of Alamitos Creek and Guadalupe Creek and flows northerly through downtown San Jose to San Francisco Bay. Calero, Guadalupe, and Almaden Reservoirs are located on tributaries to the Guadalupe River. These reservoirs are built for water conservation purposes, but also provide some incidental flood control benefit.

On its way to the San Francisco Bay, the Guadalupe River is joined by Ross, Canoas, and Los Gatos Creeks. Lexington Reservoir and Lake Elsman are located on Los Gatos Creek. The total drainage area of the Guadalupe River Watershed is approximately 41,400 hectares (170 square miles) and is the second largest watershed in Santa Clara County, after Coyote Creek. The Lower Guadalupe River begins at I-880 and flows within the city limits of San Jose and Santa Clara, before it confluences with south San Francisco Bay.

The major problems in the Guadalupe River Watershed are the threat of water quality degradation in the streams and the lack of adequate capacity to safely convey the design flow.

In recent years, activities related to development, such as agricultural activities, industrial spills, transportation activities, leaking underground storage tanks, urban runoff, illegal dumping and nonpoint source pollution, have threatened surface water and groundwater quality in the Guadalupe River Watershed. Regulatory agencies have begun to regulate all discharges that enter creeks and flow into the bay.

The need for LGRP improvements is also well substantiated by historical flooding and flood damage and hazards in the Cities of San Jose and Santa Clara. Flooding has inundated as many as 2,104 hectares (ha; 5,200 acres [ac]) during the most severe floods (SCVWD 1999). River flooding has caused bank erosion, debris accumulation, sediment deposition, and damage to homes, businesses, roadways, bridges, and other facilities. A design flood flow on the Guadalupe River without completion of the Downtown and Lower Guadalupe Projects would inundate approximately 3,273 residential units, 951 commercial and industrial properties, and 66 public structures. A total of approximately 4,290 buildings would be flooded, and total flood damages are estimated at $560 million.

Other significant problems in the watershed are intensive ongoing maintenance operations, and problems related to erosion, sedimentation, fish passage, and local drainage. In the last 10 years, the District has spent more than $5 million on erosion and related repairs in the Guadalupe River Watershed. Erosion repair is continuing where needed.

During the January and March 1995 storms, high water elevations were observed along the project reach from I-880 to the UPRR. The high water marks indicated that the remaining freeboard ranged from 0.6 to 0.9 m (2 to 3 ft) from UPRR to Montague Expressway and 1.1 to 1.7 m (3.5 to 5.5 ft) from Montague Expressway to I-880. During the January storm, a large amount of debris collected at the upstream Route 237 Bridge. The debris may have caused the high water elevations observed up through Tasman Drive. At Route 237, approximately 0.3 m (1 foot) of freeboard remained below the bridge soffit (bottom of the bridge) at the peak of flow. Had the flow been any larger, the debris load may have caused the water to overflow the bridge and ultimately the levees. Because the storms in January and March 1995 corresponded to approximately 15- and 25-year events, respectively, concern was raised regarding the ability of the existing channel to carry higher frequency flows.

The LGRP must reestablish channel capacity in the Lower Guadalupe River, rehabilitate existing levees, and be constructed and in place before the Downtown Project is completed. This commitment is required to ensure that the Lower Guadalupe River will be capable of conveying floodflows to the Bay, received from the upstream areas of the watershed. An additional commitment to the Corps includes accommodating vegetation within the LGRP area to meet SRA mitigation requirements for the Downtown Guadalupe River Project.

The July 1995 Guadalupe River Planning Study identified the loss of the low flow channel width and the change in vegetation species as major causes of decreased channel capacity in the Lower Guadalupe River. Additionally, a recent study by Northwest Hydraulic Consultants (NHC; NHC 2000a) confirmed the lack of channel capacity and identified similar causes for decreased channel capacity.

Considering the entire Lower Guadalupe River study area, the maximum channel capacity without freeboard is approximately 396.4 cms (14,000 cfs), with the most limiting reach located between Tasman Drive and Montague Expressway. The levees do not meet current District and FEMA levee freeboard requirements. The levees have a higher risk for flood damage to surrounding areas because of channel overtopping or levee failure.

In a related study, a geotechnical investigation of the existing Lower Guadalupe River levees was conducted by URS. This investigation, completed in April 2000, evaluated the condition of the levees in terms of slope stability, settlement, seepage, and liquefaction. Based on this investigation upgrades and repairs to a portion of the existing levee system are needed. This work must be performed to prevent levee failures and potential flood damage and to maintain Corps and FEMA certification of the LGRP levee system.

1.6 Other Programs in the Guadalupe River Watershed

There are various ongoing integrated water resources management programs in the Guadalupe River Watershed. These are being conducted by the District and others and are summarized below.

1.6.1 Measure B

In November 2000, the District voters successfully replaced an expired program assessment with a special parcel tax to protect homes, schools, businesses and roads from flooding and erosion; protect, enhance and restore healthy creek and bay ecosystems; provide additional open space, trails and parks along creeks; and provide clean, safe water in our creeks and bays.

The flood protection and stream management program beyond 2000 seeks to expand flood protection goals into a larger stream management program. The plan is to broaden the scope of District activities and to define and implement these activities in a manner which is tailored to the needs of each stream system. Each watershed will be examined to balance multiple objectives of providing flood protection, maintenance of flood carrying capacity, protection and maintenance of stream functions and values, improvements to stream functions and values, and specific community desires.

The proposed program is comprised of the following elements:

- Multi-objective flood protection projects (watershed projects)
- Expanded emergency response services to ensure the community is adequately prepared for flooding and responds appropriately
- Maintenance of flood carrying capacity and natural stream system functions and values
- In-stream water supply operations integrated with stream system functions and values
- Habitat protection and conservation to preserve and improve stream functions and values, while maximizing recreational opportunities for the community
- Expanded landuse review activities to ensure impacts of development on the functions and values of streams are addressed on a watershed scale
- Expanded environmental education programs for residents to understand and appreciate stream functions and values
- Water quality programs to protect and improve stream and Bay water quality

1.6.2 Flood Damage Reduction Program

The Flood Damage Reduction Program systematically addresses flooding, erosion, sediment, maintenance, and water quality issues in a multi-objective planning process. The District flood control projects undergo extensive planning and design before construction begins. Impacts of the projects on flows, fish and wildlife, vegetation, water quality, water supply, and homes and businesses within the watershed are all taken into account during the planning process. Public concerns are evaluated in a lengthy review process. The District also seeks to integrate other projects and programs in the watershed into the flood control projects. The current schedule for completion of projects in the Guadalupe River Watershed is:

• Downtown Guadalupe Project - Coleman Avenue/Julian Street	2004
• Guadalupe River - I-280 to Blossom Hill Road	2010
• Canoas Creek - Guadalupe River to Nightingale Drive	2027
• Ross Creek - Guadalupe River to Jarvis Avenue	2022

1.6.3 Adopt-A-Creek Program

Under the Adopt-A-Creek Program, the District will issue permits to program partners who adopt a section of creek to clean where the District has fee ownership. The program provides an opportunity for citizens to participate in cleaning the creeks and improving the water quality in the Santa Clara Valley. In the Guadalupe River Watershed, several sections of creeks have been adopted. Some of them are: Los Gatos Creek from Bascom Avenue to Leigh Avenue and Campbell Avenue to Vasona Dam, Canoas Creek from Branham Lane to Edelweiss Drive and Blossom Hill Road to Calero Avenue, Guadalupe River from Almaden Expressway to Blossom Hill Road, Alamitos Creek from Coleman Avenue to McKean Road and Harry Road to Almaden Expressway, and Guadalupe Creek from Almaden Expressway to Meridian Avenue.

1.6.4 Santa Clara Valley Urban Runoff Pollution Prevention Program

The Program is a multi-jurisdictional effort between the District, Santa Clara Valley's 13 cities, and County. The Program was established in response to two water quality regulations effecting the San Francisco Bay: the Federal Clean Water Act (CWA) and the San Francisco Bay Regional Water Quality Control Board (RWQCB).

The Program's long-term goals can be grouped into two categories: (1) long-term goals, which are directly related to regulatory requirements, and (2) long-term goals, which are designed to protect resources and beneficial uses and are less directly related to regulatory requirements.

The following long-term goals address regulatory requirements:

- Reduce heavy metal loadings and toxicity in Santa Clara Valley streams and the South Bay
- Reduce heavy metal loadings and toxicity in sediments
- Develop cost-effective solutions to storm water pollution problems
- Engage the community in the protection of aquatic resources

The following long-term goals protect resources and beneficial uses:

- Protect Santa Clara Valley watersheds and South Bay
- Protect drinking water sources of supplies
- Protect aquatic and natural resources
- Engage the community in protecting Santa Clara Valley watersheds

To comply with the various provisions of the Program's National Pollutant Discharge Elimination System (NPDES) storm water permit and to address other Program's goals, the Program implements the following control measures:

- **Public Information**: The Public Information/Participation Program (PI/P) is designed to eliminate and control storm water pollution through educational means. The PI/P Element supports the Nonpoint Source Program by providing the mechanism by which information is conveyed to the various target audiences. These audiences generally include residents, industry and commercial establishments, environmental and other interest groups, educational institutions, public agencies, and local governmental decision makers.

- **Watershed Management Measures (WMM)**: The goal of WMM is to facilitate the cost effective protection of the beneficial uses of Santa Clara Valley streams and the South Bay. Secondary goals include: (1) specifically protecting surface and groundwater drinking water supplies through coordination with District projects and activities, (2) increasing community awareness and appreciation of the importance of watersheds and water resources, including creeks and the Bay, and (3) engaging the community in watershed protection. WMM is a program-wide activity which embraces other program elements such as (1) new development and construction, (2) public information and participation, and (3) program management.

  The WMM activities also meet the requirements and the spirit of the San Francisco Estuary Project's Comprehensive Conservation and Management Plan, the Coastal Zone Act and Reauthorization Amendments (CZARA), and the Regional Board's staff guidance on New Development Controls.

- **Monitoring Program**: The overall goal of monitoring is to obtain adequate information to characterize and define problems, and in turn implement and assess the effectiveness of management measures which are designed to provide reasonable protection of resources and beneficial uses. Key objectives of Program monitoring include comparing of storm water discharges with water quality objectives, identifying sources of pollutants and toxicity, evaluating effectiveness of control measures, and providing direction to the overall Program based upon an ongoing definition and characterization of problems.

- **Public Agency Activities (PAA)**: Control measures under the PAA element have the goal of reducing or eliminating adverse water quality impacts due to construction, operation, and maintenance actions by municipalities of the Program. Successful implementation of PAA activities is particularly important since agencies in the Program should serve as good examples to the community.

- **Illicit Connection and Illegal Dumping Identification and Elimination (ICID)**: Control measures under the ICID element have the goal of identifying and eliminating nonpermissible non-stormwater discharges associated with either illegal dumping or illicit connections between sanitary/process water lines and storm drains.

- **Industrial and Commercial Discharges Control (IND)**: Control measures under the IND element are to control stormwater discharges associated with industrial and commercial activities into municipal storm drain systems.

- **New Development and Construction Activities**: The goal of new development and construction activities control measures is to minimize the adverse effects on urban runoff from new and redevelopment construction activities both during and after construction.

Activities contained within this element apply to private development and to public agency construction projects.

1.6.5 Groundwater Protection Programs

The District, along with the California RWQCB, takes a leading role in prevention and cleanup of leaking underground tanks, industrial spills, and other groundwater contaminants through a variety of ongoing programs.

- **Fuel Leaks Cleanup**: The District has been involved in overseeing the investigation and cleanup of fuel leak sites in the County since 1987.

- **Solvent Leaks Cleanup**: The District works closely with the RWQCB and other state and federal agencies to investigate and cleanup solvent leak sites. Throughout the years, solvent leaks have been impacting a few municipal water supply wells, resulting in closure and treatment of the water supply.

- **Wellhead Standards and Protection**: Since 1984, the District has been working to identify and seal wells that may pose contamination problems. Abandoned or improperly constructed wells may act as pathways for contaminants to migrate into deeper aquifers which supply drinking water. From time to time, the District conducts public education and enforcement efforts to ensure proper well construction and destruction practices.

- **Stormwater Infiltration Device (SWID) Control**: SWID are shallow stormwater drainage wells (dry wells) that catch surface drainage water and percolate it into the ground. If constructed incorrectly, these wells can contribute to groundwater contamination. In August 1993, the District Board of Directors adopted a SWID Policy. This policy provides for a program to permit and register new and existing SWIDs, as well as evaluate risk and regulate destruction of those found to be harming or at the greatest risk of harming groundwater. The policy regulates devices deeper than 3 m (10 ft) in the ground which are at most risk for polluting groundwater, including dry wells, unlined drainage sumps, and detention ponds. Pursuant to the policy, new devices are subject to siting requirements and construction standards and are not allowed in high-risk areas such as industrial sites.

1.6.6 Environmental Programs

District staff prepare environmental documents, evaluate natural resources, and develop and implement mitigation programs. Great emphasis is focused on environmental protection, including the reestablishment and maintenance of streamside habitats. Some of the programs include:

- **Vegetation Management Program**: This program addresses all the measures and procedures used by maintenance crews to remove or control vegetation on District right-of-way (ROW). These measures consist of the application of herbicides and other chemical control agents, mechanical removal, hand labor removal and agricultural methods. An EIR is being prepared to assess the short-term, long-term, and cumulative impacts of this program on wildlife and fish habitat, surface water and groundwater quality, evaluate alternate means of accomplishing the goals of the program, and recommend mitigation to compensate for any adverse impacts.

- **Erosion Control and Sediment Removal Routine Maintenance Program**: This program addresses all measures and procedures used by the Maintenance Department to perform erosion control by various structural means and both instream and off-stream sediment removal. The purpose of this program is to develop a comprehensive approach to managing routine maintenance activities on District facilities. An EIR and related Corps permit applications are being prepared to comply with Section 404 of the CWA. The EIR and permit applications will: assess the short-term, long-term, and cumulative impacts of this program on wildlife and fish habitat; assess surface water and groundwater quality impacts; evaluate a broad range of alternatives in an equal level of detail; reduce the level of maintenance on any stream, up to a point where the stream can be self-maintaining; and, define a formula for compensatory mitigation for impacts, a formula which identifies when on-site mitigation is appropriate, and when off-site mitigation within the watershed is appropriate.

- **Stream Database Program**: This program is a comprehensive and cost-effective biological survey of streams within the Guadalupe River Watershed, evaluating the physical, biological and adjacent land use elements. This program will provide an advance planning tool with site-specific habitat descriptions and general evaluation of stream resources to assist in the early stages of flood control project planning and assessment. This information would serve as an early warning system by enabling staff to select alternatives that avoid major impacts to natural resources that could jeopardize the success of a project. This program will identify potential revegetation sites as part of District's project planning needs or as advance mitigation of impacts. It will also provide guidance to other cooperating agencies or organizations requiring project-related mitigation or restoration sites for jointly sponsored and mutually beneficial projects.

- **Multipurpose Constructed Wetlands Project**: This is a potential cooperative project between the District, the Urban Runoff Pollution Prevention Program, and the City of San Jose. This project would address flood control mitigation, spill mitigation and potential future regional wetlands mitigation banking program. The findings of this project will also provide information for the Urban Runoff Pollution Prevention Program on storm water treatment demonstration project and also provide information to the City wastewater treatment plant on effluent discharge reduction to the Bay during the dry season.

- **Summer Dams Fisheries Study**: This project is to monitor and study the impacts of construction and operation of in-stream seasonal spreader dams on anadromous fish.

Seasonal dams located in Coyote Creek, Guadalupe River, Los Gatos Creek, Saratoga Creek, Upper Penitencia Creek, and Stevens Creek are included in the study.

1.6.7 Comprehensive Reservoir Water Management Program

The goal of this program is to develop a District policy and program to protect the drinking water quality and supply of nine of the District's reservoirs. The impetus for this project is driven by the following:

- Increasingly stringent drinking water regulations that emphasize source water protection (e.g., with this project, the District supports the Safe Drinking Water Act and the CWA in protecting water quality)
- Increasing unreliability of imported water (e.g., the environmental issues in the Delta put the quantity of imported Delta water the District receives in jeopardy)

The increasing demand for more recreational facilities and development in the County may place additional stress on reservoir operational flexibility and may have the potential to affect reservoir water quality.

This project will ensure that operational flexibility and water quality are preserved while ensuring and balancing community interests and needs. The project will develop a plan and methods to implement the plan, to be supported by the District's Board of Directors and the County Board of Supervisors. The project focuses on the watershed lands above the reservoirs. Because the District owns so little land in these watersheds, the County is the landuse agency responsible for land use control, a partnership between the County and the District is essential in order to achieve a reasonable level of protection of the County's water supplies.

Reservoir watershed management will provide an additional barrier of protection to the public water supply. It will also be more effective to prevent impacts to the reservoir than eliminate them once they have occurred. By this project, the District hopes to prevent negative impacts from occurring to the reservoirs when land use changes, development and activities occur.

1.6.8 Environmental Compliance Programs

The District manages hazardous waste and ensures that the District complies with local, state, and federal hazardous material regulations. The District conducts hazardous materials preacquisition investigations and remediates hazardous materials problems for the District's capital improvement projects. Great emphasis is focused on response to hazardous material spills and illegal dumping. This protects the public and the environment, including fish, wildlife, and streamside habitats. Some of the programs this division manages are:

- **Alignment Investigations Program**: This program identifies potentially contaminated sites within a project area and delineates the extent of hazardous material contamination in the project alignment. All remedial activities will also be performed to minimize the impacts of, and the District's liabilities due to, hazardous material on District capital improvement projects.

- **Property Acquisition Program**: This program investigates and evaluates the impacts of hazardous materials on properties, which will be acquired by the District in fee or easement.

- **Emergency Response Program**: This program is developed to protect the public, surface water, groundwater, and fish and wildlife from hazardous material spills or illegal disposal of hazardous material on District property, easement or ROW.

- **Facility Compliance Program**: This program ensures that the District facilities and the District's hazardous materials management comply with all local, state, and federal hazardous material regulations.

- **Well Ordinance Program**: This program ensures that the construction, maintenance, and destruction of wells in the County complies with the District's Ordinance and state regulations through a system of permitting and inspection.

1.6.9 Community Project Review Programs

The District has adopted policies and ordinances to regulate and protect the water resources in the County. Ordinance 83-2 applies to all water resources in the County and prohibits the pollution of the water supplies of the District, whether in surface streams, reservoirs, other conduits of any kind, or groundwater. This ordinance requires a District permit for the installation of any outfall discharging into a watercourse under District jurisdiction and revegetation, construction, or soil disturbances within 15 m (50 ft) of any creek bank. The objective of Ordinance 83-2 is to allow the District to properly manage streams to prevent or minimize erosion, preserve water quality, contribute to survival of the area's fish and wildlife, and help avoid flood losses. The life of a stream reflects conditions throughout its watershed, and not just those along its banks. The Community Project Review Unit reviews plans and issues a permit only after investigating that the proposed work will not impact the District's facilities. Violation of the provisions of the ordinance and any failure to satisfy the terms of the permit are punishable as a misdemeanor.

Some of the programs with which the Community Project Review Unit is actively involved in are:

- **Ordinance 83-2 Violations Program**: This program identifies violations of Ordinance 83-2 throughout the County and requires the violator to correct the condition within a specified time. Examples of common violations are: encroachment, illegal outfall, dumping, and erosion. In the Guadalupe River Watershed, approximately 56 violations were reported and acted upon by the District in 1993.

- **Stream Care Brochure**: This brochure promotes public awareness and encourages active participation from every resident in the County. This brochure addresses the preservation and enhancement of the streamside environment, protection of streams, and effective watershed management. The brochure targets streamside property owners to help reduce the number of Ordinance 83-2 violations.

1.6.10 Water Supply Programs

As a water wholesaler and manager of water resources in the County, the District conserves, imports, treats, distributes, reclaims, and is responsible for the quality of water in the County. To meet its water supply objectives, the District constructed and now operates and maintains a countywide conservation and distribution system to convey raw water for recharge and treatment.

- **Reservoir Storage**: The District currently operates and maintains 10 local reservoirs that conserve local runoff for either local recharge or treatment at one of the District's three water treatment plants. Five of the ten local water conservation reservoirs are within the Guadalupe River Watershed, as shown on Figure 1-1. The Calero/Almaden Reservoir systems have the ability to deliver raw water to one of three water treatment plants.
- **Artificial Groundwater Recharge Program**: The District owns and operates more than 30 recharge facilities in six major recharge systems. These recharge facilities percolate local or imported water into the groundwater basin. The Los Gatos and Guadalupe recharge systems are within the Guadalupe River Watershed. In-stream recharge is enhanced by the construction and operation of temporary dams. Off stream recharge is performed at percolation ponds that are fed by water diverted from the creeks or by imported water pipelines.

1.6.11 Stream Maintenance Program

The District is currently in the process of implementing the District-wide Stream Maintenance Program (SMP) and is preparing an SMP EIR to address potential impacts of that Program. The EIR will address the impacts of sediment removal, erosion protection, vegetation control, and other elements on a program level. Any residual impacts that remain after BMPs are implemented will be identified and mitigated. The impacts the SMP will have on the Guadalupe River will be addressed within that Program. Maintenance criteria and activities required beyond the SMP, for the Lower Guadalupe River, are incorporated in the Lower Guadalupe River Project.

1.6.12 Instream Recharge Program

The District Instream Recharge Program involves the placement of instream spreader dams to percolate surface water into the channel and thereby replenish the groundwater basin. The Instream Recharge Program consisted of 50 project sites distributed throughout the County. On the Guadalupe River system, historic sites are located on the Upper Guadalupe River, and Los

Gatos Creek. The CWA Section 404 permit that governed the District's use of gravel dams for instream recharge expired in 1994, and the San Francisco Bay RWQCB indicated to the District that CEQA compliance would be required before new permits could be issued. In March 1995, the District released a draft EIR for a proposed Instream Recharge Program that would continue activities associated with the installation and operation of as many as 44 spreader dams providing 41.94 million cubic meters ($m^3 \times 10^6$) (34,000 acre-feet [af]) artificial groundwater recharge annually, or 23 percent of the District's artificial recharge capacity. The Instream Recharge Program is currently under review by the District. The program that will be proposed as a result of this reconsideration is not known at this time. However, the District has committed to cease operation of instream spreader dams in Guadalupe Creek.

1.6.13 Fisheries and Aquatic Habitat Collaborative Effort

The Guadalupe River, Coyote Creek, and Stevens Creek provide habitat for a variety of aquatic resources, including fall-run Chinook salmon and Steelhead trout. Many activities, including water management, urban encroachment, land uses, agricultural use, reclamation, flood control, and water supply operations by the District, cause concern for the condition of the public trust resources and the quality and availability of instream habitat in the river and creeks. These activities also raise concern about the economic and social impacts of efforts to significantly alter the existing flow regimes of the river and creeks. The District has been named in a complaint filed before the State Water Resources Control Board (SWRCB) for violations of the California Department of Fish and Game (CDFG) Code, the California Water Code, and Public Trust Doctrine related to the District's incremental contribution to the cumulative impacts on Chinook salmon and Steelhead trout and their habitat within the river and creeks. The complaint alleges harm to cold water fisheries as a result of consumptive urban and agricultural water uses in the County. To address this complaint, the Fisheries and Aquatic Habitat Collaborative Effort (FAHCE) has been initiated jointly by the District and CDFG.

The FAHCE will identify factors limiting Steelhead trout and Chinook salmon populations in the Guadalupe River, Coyote Creek, and Stevens Creek watersheds. Both flow and nonflow measures will be considered by the FAHCE when addressing the complaint. Participants include the District; CDFG; Guadalupe-Coyote Resource Conservation District, Pacific Coast Federation of Fishermen's Associations, and Trout Unlimited, as represented by Natural Heritage Institute (NHI); National Marine Fisheries Service (NMFS); U.S. Fish and Wildlife Service (USFWS); and the City. The FAHCE study is expected to be completed in 2001.

1.6.14 Multiple Species Habitat Conservation Plan

The District, in cooperation with USFWS, NMFS, and CDFG, is preparing a Multiple Species Habitat Conservation Plan (MSHCP). The MSHCP addresses the District's activities and responsibilities under the Endangered Species Act (ESA), as amended (16 USC 1531-1544). The MSHCP is expected to be completed in 2001. In preparing the MSHCP, the District is requesting an incidental take permit under Section 10(a) of the ESA to conduct flood protection, water supply, and related activities within the District's operational area.

The MSHCP addresses projects, activities, and the process the District will use to evaluate the potential for take of covered species. The MSHCP, including the conservation measures, applies only to the District and its activities. The Guadalupe River is not included in the MSHCP because of the ongoing coordination with USFWS, NMFS, and CDFG regarding projects on the river. Because the District does not regulate land uses in the County, the MSHCP does not cover individuals or other agencies in the County.

1.6.15 Guadalupe Fisheries Management Plan

The expected goal of the Guadalupe Fisheries Management Plan is to develop a comprehensive management plan to preserve, protect, and enhance the fishery and aquatic resources of the Guadalupe River and those tributaries capable of supporting or contributing to these resources. The Guadalupe Fisheries Management Plan is in the early preplanning stages.

The expected objectives of the plan are as follows:

- Provide guidance for fisheries habitat protection and restoration in the Guadalupe River Watershed
- Identify actions the District can take to maintain and improve existing habitat for native fish
- Facilitate communication with stakeholders, including environmental organizations, the public, and regulatory/resource agencies
- Provide a focus for the District's BMPs, program and project coordination, and budgeting for the Guadalupe River Watershed
- Provide a coordinated effort to protect and mitigate impacts on fishery resources associated with construction projects, and operations and maintenance (O&M) tasks
- Encourage innovative solutions for improving aquatic habitat
- Act as a catalyst for native fish enhancement efforts in South Bay streams

1.6.16 City of San Jose

The San Jose city council adopted the Horizon 2000 General Plan for the City in 1984. The Plan seeks to balance natural resource conservation and urban development so as to maximize the achievement of environmental, economic, and social needs.

The City plans to protect water resources wherever possible. Policy No. 3 of the City's Water Resources Goals and policies states: "Protect water resources because they are vital to ecological and economic health of the region and its residents. The City, in cooperation with the District, should restrict, or carefully regulate, public and private development in watershed areas, especially those necessary for effective functioning of reservoirs, ponds, and streams, and for the prevention of excessive siltation. The City should protect important groundwater recharge areas, particularly creeks and creeksides, from urban development.

The City of San Jose Riparian Corridor Policy provides policy and development guidelines for riparian areas along all creeks in the City of San Jose and therefore affects the Guadalupe River Watershed. The study defines the riparian corridor and provides development guidelines for setbacks, access control, landscaping, lighting, and compatible land uses. Implementation of riparian corridor development guidelines could help to reduce the severity of cumulative impacts in the Guadalupe River Watershed.

The City also plans to preserve riparian resources wherever feasible. Policy No. 5 of the City's Marinelife and Wildlife Resources goals and policies states: "Preserve areas of special marine and wildlife habitation, particularly those containing endangered species, as living research and recreational resources, and as indispensable parts of the total environment. Any development involving unmitigated adverse impacts on the National Wildlife Refuge in south San Francisco Bay should not be permitted. Consideration should be given to setting aside nature preserves in the Bay, marshes, streamsides, streambeds, and hillside areas to protect habitats of essential, rare and endangered species of plants and animals, and to provide areas for educational and research purposes.

The City is a participant in the Santa Clara Valley Nonpoint Source Pollution Control Program and is a co-permittee with 14 other agencies in the County for the NPDES permit issued by U.S. Environmental Protection Agency (EPA) to the program in June of 1990. As a participant in the Nonpoint Source Program, the City is responsible for implementing program elements in its area of jurisdiction and must submit an annual report to be included in the Santa Clara Valley NPDES annual report.

1.6.17 County of Santa Clara

The County General Plan (1990) has protective measures in reference to creeks and streamside areas in its Natural Environment, Lands Use and Public Safety Elements.

Some measures include the following:

- Public projects shall be designed to avoid damage to the stream environments.
- Where possible, riparian woodlands, marshes, and floodplains that have been altered should be allowed to return to a natural state.
- In floodplains which are not already developed, land uses shall be restricted to avoid the need for major flood control alterations to the streams.
- Public projects should preserve the stream environment and should provide multiple use for such purposes as parks, open space preserves, trails, and flood control.

1.6.18 Guadalupe River Planning Study, County Marina to UPRR

This Planning Study included an Engineer's Report and Negative Declaration, which was completed in March 1983 by the District (Anderson-Nichols & Co., Inc. 1983). The report described the flooding problem, various alternatives to alleviate the problem, and presented estimated costs and impacts of these alternatives. A Draft Negative Declaration was included with the planning study and was circulated to interested parties for review. During the review period, the District Board of Directors received comments on the report, the Negative Declaration, the EIS, and the proposed project at a public hearing. At the conclusion of the hearing on March 8, 1983, the Board approved the project and authorized final design of the recommended levee improvements between the UPRR and the County Marina.

1.6.19 Hydraulic Analyses of the Guad 104 Reach Along the Guadalupe River

A hydraulic analyses report was prepared for the Corps in November 1989 (Water Engineering & Technology, Inc. 1989). The report contained hydraulic analyses results of flood discharges along the Guadalupe River in the vicinity of Alviso, Santa Clara and San Jose, California. The study reach extends from the UPRR Bridge crossing of Guadalupe River (downstream study limit) to I-880 (upstream study limit) – a total distance of approximately 10,700 m (35,000 feet). This study segment of the Guadalupe River hereafter become known as Guad 104.

The study was initiated to determine the hydraulic characteristics of the Guad 104 improvements. Results of the analysis were used by Sacramento District of the Corps to help make a determination regarding the adequacy and acceptability of the District improvements to Guad 104, as credits to the local cost-sharing component of the Sacramento District improvement plan to be implemented upstream.

The Guad 104 area of the Guadalupe River originally was channelized and leveed by the Santa Clara County Flood Control and Water Conservation District in 1963. The improved channel was constructed generally with a bottom width of 80 feet, 4:1 side slopes and a design capacity of approximately 12,000 cfs. Over time, flood conveyance was reduced because of sedimentation and vegetation growth. By 1982 to 1983, the District planned and constructed additional improvements to increase the flood conveyance capacity of the channel.

1.7 Related Engineering Studies and Projects

From approximately 1960 to present, numerous engineering studies have been conducted on the Guadalupe River to address flood protection water quality and biotic resources. The following sections identify pertinent historical documents that were written by the Corps, the District, and other authors.

1.7.1 Sedimentation Study

A Sedimentation Study was prepared for the District (NHC 2000b) to develop an understanding of the Lower Guadalupe River hydraulics with respect to its ability to convey flow and sediment materials now and in the future. The object was to gather the necessary historical and field information required to develop tools, to quantify a sediment transport of the Lower Guadalupe River, to evaluate present and future sediment yield to the study reach, channel capacity, and maintenance requirements to meet planning, environmental and design needs of the District. Both long-term trends in river degradation and aggradation as well as episodic single flood events were evaluated for existing conditions and for two alternative channel designs.

The sedimentation study area extends along the project area of the Lower Guadalupe River from I-880 downstream to the UPRR, just south of Alviso, California (Figure 1-2). A number of natural and man-induced modifications and physical processes affect sediment transport and flow carrying capacity in the Project Area. The most significant geomorphological characteristics include the local geology, regional seismicity, tidal processes, past subsidence in the region, a rising sea level, changes in land use in the watershed and on the floodplains, urbanization, channel improvement projects upstream from the LGRP area, sediment accumulation from tidal and terrestrial sources, bridge constrictions and aggressive encroachment of in-channel vegetation along portions of the Guadalupe River. All of these agents and processes contribute to decreasing channel capacity with time and increasing annual maintenance requirements to meet present and future levels of flood conveyance required by the District.

1.7.2 Guadalupe River Watershed Planning Study

In November 1999, the District released a Watershed Planning Study-Engineer's Report that presents the water resource related problems in the Upper Guadalupe River Watershed, including water quality and flooding. The report describes the various ongoing integrated water resources management programs in the watershed that are addressing those problems. It also describes a recommended ongoing integrated water resource management capital improvement project on the Guadalupe River between I-280 to Blossom Hill Road. A wide variety of alternatives and their significant affects are discussed in the report, which is scheduled for District Board action in August 2001.

1.7.3 Downtown Guadalupe River Plans

In June 2000, the Corps, Sacramento District and the District released a draft of the EIR, which addresses proposed modifications to the federally authorized Guadalupe River Project in downtown San Jose, California. These modifications include flood protection, recreation, and related mitigation measures primarily along 4,184 m (2.6 mi) of the Guadalupe River, between I-880 and I-280, and two related off-site mitigation areas. The Engineer's Report supports decision making by the District, between I-880 and I-280, and other responsible agencies to implement proposed project modifications and ensure compliance with the National Environmental Policy Act (NEPA), CEQA, and other pertinent laws and regulations. Potential direct and indirect environmental, social, and economic effects of the Proposed Action and alternatives are evaluated, and project modifications are recommended for implementation. The report was prepared by the Corps and District (project sponsors) and was finalized in March 2001.

1.7.4 Los Capitancillos Freshwater Wetland Mitigation

The Los Capitancillos Freshwater Wetland Mitigation Site Development project is proposed on the District-owned property adjacent to the Guadalupe Creek Restoration Project site near Masson Dam. The District is proposing to implement a wetland mitigation project that would include the construction of a 20.2 square kilometers (km^2; 5 ac) seasonal freshwater wetland. The wetland will provide habitat for common seasonal freshwater plants and associated vertebrate and invertebrate species. The District-owned parcel is currently a relatively flat, open, weedy field. The Engineer's Report and the environmental documents for this project are scheduled to be completed by fall 2001.

The preliminary design concept for the project consists of a series of interconnected wetland basins, including an upland sedimentation area. Water will flow into the southwest end of the wetland from the District's Almaden Valley pipeline. No surface water from the wetland mitigation site will flow into Guadalupe Creek under the existing conceptual plan. Because the site is located in a residential area, it is anticipated that the final design will include passive recreational features, such as a pedestrian walkway, wildlife viewing areas, and interpretive signs, as well as vegetation barriers or fences.

1.7.5 Guadalupe River Planning Study, UPRR in Alviso to Highway 101

The District prepared a planning study, which consisted of the Engineer's Report and a focused EIR in September 1982. The report presented a discussion of a proposed flood control project for the Guadalupe River in the reach from the UPPR (known as Southern Pacific Railroad at the time) in Alviso to the Highway 101. The scope of the report included a description of the flooding problem, the alternative solutions investigated including estimated costs, and a discussion of the recommended project, its structural elements, costs, and financing.

The project, in conjunction with future projects upstream and downstream from the reach, would provide protection from flooding of adjacent lands during the occurrence of the design flood. Under existing conditions, the project alone would not prevent flooding of the floodplain area adjacent to Guadalupe River between the UPPR and Highway 101. It was anticipated that the proposed upstream Corps Guadalupe River project between Highway 101 and Park Avenue would capture the water overflows of Guadalupe River between I-880 and Curtner Avenue, upstream from the proposed project, that could potentially run overland to the Alviso area.

1.7.6 Guadalupe River Planning Study, UPRR to Highway 101

This District report was completed in July 1995 and presents the results of an investigation of the high water elevations, which were observed along the Guadalupe River, north of Highway 101 to the UPRR in Alviso during the January and March 1995 storms.

1.8 State Regulations

In addition to complying with the requirements of CEQA and NEPA, the LGRP must fulfill other environmental requirements. These state requirements are described and summarized in the following subsections.

1.8.1 California Fish and Game Code Section 1600

CDFG regulates work that will substantially affect resources associated with rivers, streams, and lakes in California, pursuant to CDFG Code Sections 1600-1607. Under Section 1601 of the CDFG Code, any state or local governmental agency or public utility must notify CDFG if it proposes to (1) divert, obstruct, or change the natural flow or bed, channel, or bank of any river, stream, or lake designated by CDFG in which there is at any time an existing fish or wildlife resource or from which these resources derive benefit, (2) use materials from the streambeds designated by CDFG, or (3) dispose of or deposit debris, waste, or other materials containing crumbled, flaked, or ground pavement where it can pass into any river, stream, or lake designated by CDFG.

Any person, governmental agency, or public utility proposing any activity that will divert or obstruct the natural flow or change the bed, channel, or bank of any river, stream, or lake or proposing to use any material from a streambed must first notify CDFG of such proposed activity. This notification requirement applies to any work undertaken within the 100-year floodplain of a body of water or its tributaries, including intermittent streams and desert washes. In practice, however, the notification requirement generally applies to any work in the riparian corridor of a wash, stream, or lake that contains or once contained fish and wildlife or supports or once supported riparian vegetation.

1.8.2 California State Water Resources Control Board

The California SWRCB is responsible for the quality of the water in the state waterways. The nine RWQCBs that implement the policies of the SWRCB make policy recommendations and issue permits to improve water quality. The San Francisco RWQCB has issued three general NPDES permits, which are applicable in the Guadalupe River Watershed.

NPDES General Industrial Activity Stormwater Permit

This permit applies to storm water discharges by certain regulated industries. Federal law requires that industrial storm water discharges meet all provisions of Sections 301 and 402 of the federal CWA to control pollutant discharges. These provisions require the use of the best available technology economically available and the best conventional pollution control technology to reduce pollutants and any more stringent controls necessary to meet water quality standards.

NPDES General Construction Activity Stormwater Permit

This permit is required of all construction projects disturbing five or more acres of land area. BMPs to control storm water runoff both during and after construction are required.

NPDES Municipal Stormwater Permit

Municipalities with a population more than 100,000, or those that have been determined to be significant contributors of pollutants, are required to obtain NPDES municipal storm water permits. The applicants are required to collect existing information regarding storm water discharges and receiving water quality, provide adequate fiscal resources, and prepare a storm water management program. The Guadalupe River Watershed falls within the jurisdiction of the NPDES permit issued to the Santa Clara Valley Nonpoint Source Pollution Control Program.

1.8.3 Caltrans Encroachment Permit

The California Department of Transportation (Caltrans) is responsible for planning, designing, constructing, operating, and maintaining state-owned roadways. Caltrans issues permits for projects affecting the ROWs of state-owned roadways. Caltrans issues permits for encroaching on land within its jurisdiction to ensure that the proposed encroachment is compatible with the primary uses of the state highway system, to ensure the safety of both the permittee and the highway user, and to protect the state's investment in the highway facility.

Actions proposed within, under, or over a state highway ROW such as rerouting and protecting infrastructure; opening or excavating a state highway for any purpose; constructing and maintaining road approaches or connections to a ROW; grading within the ROW on any state highway; or placing, changing, or renewing an encroachment, require an Encroachment Permit. An encroachment requiring permanent access or maintenance within a freeway or expressway ROW can be considered for a permit only if the following restrictions are met:

- The encroachment is related to a public facility or to a utility dedicated to public use.
- Alternative locations for the encroachment are inordinately difficult or unreasonably costly.

- The encroachment is as near as possible to the outer boundary of the ROW.
- The encroachment is approved by the Chief of the Caltrans Office of Project Planning and Design and possibly also by the Federal Highway Administration when federal facilities or funds are affected.

1.9 Federal Regulations

In addition to complying with the requirements of CEQA and NEPA, the LGRP must fulfill other environmental requirements. These federal requirements are described and summarized in the following subsections.

1.9.1 Disabilities Regulation

The Americans with Disabilities Act (ADA), the Rehabilitation Act, and the Architectural Barriers Act (ABA) Title II, and Section 202 of the ADA require projects administered by state and local governments to provide program accessibility to persons with disabilities as long as providing accessibility would not fundamentally change the purpose of the project. Section 504 of the Rehabilitation Act requires program accessibility for persons with disabilities to any program or activity receiving federal financial assistance. The ABA requires accessibility for persons with disabilities to federally financed facilities constructed or altered on behalf of the United States. To conform with the ADA, the Rehabilitation Act, and the ABA, the project sponsors have ensured that the recreational trail system incorporated into the Guadalupe River Project adheres to the construction guidelines of the Uniform Federal Accessibility Standards. In addition, the project sponsors have taken into consideration the regulations for trail development and outdoor recreational facilities that have been proposed for incorporation into the ADA Accessibility Guidelines.

1.9.2 The Rivers and Harbors Act

The Rivers and Harbors Act was enacted by Congress in 1899 to protect interstate commerce in navigable waters through the regulation of streams and rivers. Sections 9 and 10 of the Act relate to protecting navigable waters. Section 9 of the Rivers and Harbors Act requires an applicant to obtain a permit to construct a dike or dam in navigable waters of the U.S. Under Section 10, the Corps regulates projects or construction of structures in or over any navigable water of the U.S., including the excavating from or depositing of material in any such waters. Limits of navigable water jurisdiction in the Guadalupe River extend up through the upstream end of this project.

1.9.3 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act was established to protect the quality of the aquatic environment as it affects the conservation, improvement and enjoyment of fish and wildlife resources. The Fish and Wildlife Coordination Act requires that any federal agency that proposes to control or modify any body of water must first consult with the USFWS and the NMFS.

1.9.4 Endangered Species Act (Section 7)

The federal ESA requires federal agencies to consult with the Secretary of the Interior (USFWS) and the Secretary of Commerce (NMFS) to ensure that agency actions do not jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of the critical habitat that supports such species.

The state ESA requires agencies to consult formally with CDFG when the proposed action may affect state-listed endangered or threatened species.

1.9.5 Federal Clean Water Act

The federal CWA was enacted by Congress in 1972 and its goal was to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." To meet this objective, Section 301 of the CWA prohibits the discharge of any pollutants into navigable waters, except what is allowed by permits issued under Sections 402 and 404.

1.9.6 Sections 401, 402, and 404 of the Clean Water Act

Section 401 addresses effluent standards and water quality standards by requiring, in addition to a dredge and fill discharge permit, water quality certification from the SWRCB.

Section 402 authorizes the EPA to issue permits under procedures established to implement the NPDES program.

Section 404 authorizes the Corps to issue permits for and regulate the discharge of "dredge or fill materials into waters of the U.S." Waters of the U.S. include the following:

- All waters that are currently used, or that were used in the past for commerce, including waters that are subject to the tide
- All interstate waters, including lakes, rivers, streams, intermittent streams, sloughs, and natural ponds
- All impoundments of water
- Tributaries of waters
- Wetlands adjacent to waters

Once an area has been identified as a federal water and a permit is applied for, an environmental assessment is required under NEPA. The NMFS and USFWS review and comment on all Section 404 permit applications. In addition, the RWQCB is responsible for certifying Section 404 permits as being in compliance with state water quality standards.

1.9.7 Coastal Zone Act Reauthorization Amendments of 1990

The Coastal Zone Management Act was originally passed by Congress in 1972 to voluntarily develop comprehensive programs to protect and manage coastal resources. To receive federal approval and implementation funding, states had to demonstrate that they had programs, including enforceable policies, that were sufficiently comprehensive and specific both to regulate land uses, water uses, and coastal development and to resolve conflicts between competing uses. In 1990, Congress enacted the CZARA. These amendments were intended to address several concerns, one of which is the impact of nonpoint source pollution on coastal water quality.

CZARA guidance specifies management measures for channel modifications as follows:

- Management measure for physical and chemical characteristics of surface waters
- Evaluate the potential effects of proposed channel modifications on the physical and chemical characteristics of surface waters in costal areas
- Plan and design channel modifications to reduce undesirable impacts
- Develop an operation and maintenance program for existing modified channels that includes identification and implementation of opportunities to improve physical and chemical characteristics of surface waters in those channels

Instream and riparian habitat restoration management measures include the following:

- Evaluate the potential effects of proposed channel modifications on instream and riparian habitat in coastal areas
- Plan and design channel modifications to reduce undesirable impacts
- Develop an operation and maintenance program with specific timetables for existing modified channels that includes identification of opportunities to restore instream and riparian habitat in those channels

1.9.8 National Historic Preservation Act (Section 106)

The National Historic Preservation Act (NHPA) of 1966, as amended, requires federal agencies to take into account the effects of a proposed undertaking on cultural resources listed or eligible for listing on the National Register of Historic Places (NRHP). Because historic properties could be affected by the Guadalupe River Project, the Corps is complying with Section 106 of the NHPA. Section 106 requires federal agencies or agencies for which they provide funding or issue permits to take into account the effects of their actions on properties that may be eligible for listing or that are listed in the NRHP.

The Section 106 review process consists of four steps: (1) identification and evaluation of historic properties, (2) assessments of the effects of the undertaking on properties that are eligible for listing in the NRHP, (3) consultation with the California State Historic Preservation Officer and appropriate agencies to develop an agreement addressing the treatment of historic properties, and (4) receipt from the Advisory Council on Historic Preservation of comments on the agreement or results of consultation.

1.9.9 Executive Order 11988 – Floodplain Management

Executive Order 11988 requires federal agencies to recognize the significant values of floodplains and to consider the public benefits that would be realized from restoring and preserving floodplains. Under this order, the Corps is required to provide leadership and take action to accomplish the following objectives:

- Avoid development in the base floodplain, unless such development is the only practicable alternative
- Reduce the hazard and risk associated with floods
- Minimize the impact of floods on human safety, health, and welfare
- Restore and preserve the natural and beneficial values of the base floodplain

1.9.10 Executive Order 11990 – Protection of Wetlands

Executive Order 11990 directs federal agencies, in carrying out their responsibilities, to provide leadership to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. This policy states that federal agencies should avoid, to the extent possible, the short- and long-term adverse impacts associated with destruction or modification of wetlands. It also states that agencies should avoid undertaking and providing support for new construction in wetlands, including draining, dredging, channelizing, filling, diking, impounding, and other related activities, unless the agency finds that no practicable alternatives exist and all practical measures have been taken to minimize harm to wetlands.

1.9.11 Executive Order 12898 – Environmental Justice

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority and Low-Income Populations," requires each federal agency to identify and address any disproportionately high and adverse human health or environmental effects of its actions on minority and low-income populations.

1.9.12 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) (16 USC 703 et seq.) implements various treaties and conventions between the U.S., Canada, Japan, Mexico, and Russia, providing protection for migratory birds as defined in 16 USC 715j. The MBTA makes it unlawful for any person to take, kill, capture, collect, possess, buy, sell, trade, ship, import, or export any migratory bird, including feathers, parts, nests, or eggs. The MBTA does not protect the habitat of migratory birds. Construction of all project alternatives would comply with provisions of the MBTA.

1.10 Capital Improvement Project

A multi-objective capital improvement project in the Lower Guadalupe River from the UPRR to I-880 is recommended as part of this study. This project area is at the lower portion of the Guadalupe River Watershed. The improvements in the middle part of the watershed are included in the Downtown Project, which has been under construction since 1993. The proposed improvements in the upper watershed, the portion of the Guadalupe River that lacks adequate capacity to safely convey the design flood flow; lacks continuity for a future trail from Alamitos Creek to downtown San Jose; and contains fish barriers that hinder fish migration to upstream habitat are addressed in the Guadalupe River Watershed Planning Study, scheduled for completion in August 2001.

In a multi-objective integrated water resource planning process, the District evaluates a variety of alternatives that would best satisfy all the objectives of the District and community on a watershed basis. Each alternative is assessed for its effectiveness in addressing problems and its impacts on riparian vegetation, wetland, wildlife habitat, fishery, water quality, water supply, local drainage, aesthetic, and recreation. This is facilitated through the use of a Project Planning Team, which consists of District staff from various departments and areas of expertise. To ensure all concerns were addressed, the recommended alternative was developed in close coordination with the Cities of San Jose and Santa Clara, and citizens residing or owning property in the floodplain of the river. The District also seeks to integrate other water resource management programs in the watershed into the recommended project.

Alternatives that have been evaluated during the planning process include "no project", non-structural, upstream floodwater storage (reservoir construction and reservoir operation alterations), offstream storage, and channel modifications. The levee raise/floodwall alternative was selected because it is practicable and achieves most of the District's goals and objectives. Other alternatives are considered infeasible and impracticable because of high costs, only partially solve the flooding problems, the high social impacts of relocating families and removing homes or businesses, greater impacts to the aquatic and wildlife ecosystem, and major impacts to the water supply in the valley.

During the course of the evaluation, public input was sought through a series of meetings. Public meetings were held in January 2000, May 2000, and March 2001. Feasible alternatives and a selected plan were discussed. The people that attended the meetings were generally supportive of the project. There were also follow up field meetings with the residents to discuss their concerns.

There were also meetings held with the Corps, CDFG, NMFS, and the USFWS to develop a refined plan that would reduce the impacts of the project and mitigate the unavoidable impacts.

An extensive survey of the Lower Guadalupe River was performed for this study. It included riparian vegetation mapping, assessment of historic sedimentation problems, identifying specific erosion sites and hazardous material sites, stormwater outfalls inventory, existing and future land use inventory, and parks and trails master plan assessment. A study of the local and regional hydrological, geological, ecological, recreational, historical, and cultural issues affecting the lower river corridor was also conducted. In addition, a reconnaissance-level study of the Alviso Baylands was conducted to evaluate project impacts to areas downstream of UPRR, to San Francisco Bay.

The recommended capital improvement project would improve water quality and provide design flood capacity in the Lower Guadalupe River. Sediment and turbidity in the water caused by erosion of banks would be reduced as the project would decrease the frequency of erosion on banks. Maintenance and public access to the natural resource would be made available. Future implementation of the trail master plan from downtown San Jose to the Alviso Baylands would be feasible.

The construction of this project and this project's integration with other projects and programs in the Guadalupe River Watershed, could help prevent the ongoing physical degradation of the natural stream, water quality, wetlands, riparian habitat, and fish habitat in the Guadalupe River Watershed.

A summary of recommended alternative capital construction costs are presented in Table 1-1, Summary of Recommended Alternative Capital Construction Costs, on the following page, and in Chapter 7.

Table 1-1
Lower Guadalupe Flood Protection Project
Summary of Recommended Alternative Capital Construction Costs

Reach	Limits	Proposed Flood Protection Measures	Total Cost (millions)
A	Interstate 880 Bridge to Highway 101 Bridge	Floodwalls/levee widening/ vegetation management	$4.64
B	Highway 101 Bridge to Trimble Road Bridge	Levee raising/floodwalls/ vegetation management/ sediment removal	$2.95
C	Trimble Road Bridge to Montague Expressway Bridge	Levee raising/floodwalls/ vegetation management/sediment removal	$8.30
D	Montague Expressway Bridge to Hetch Hetchy Pipeline Crossing	Levee raising/ vegetation management/sediment removal	$6.98
E	Hetch Hetchy Pipeline Crossing to Tasman Drive Bridge	Levee raising/levee remediation/ vegetation management/ sediment removal	$8.84
F	Tasman Drive Bridge to Route 237 Bridge	Floodwalls/levee raising/ levee remediation/ vegetation management/ bridge replacement	$17.78
G	Route 237 Bridge to UPRR Bridge	Floodwalls/levee raising/ vegetation management/ sediment removal	$6.45
Baylands	UPRR Bridge to Alviso Marina	Levee raising/weir	$4.64
		TOTAL	**$60.58**

The project would be funded by existing revenues generated by the one percent property tax in the Central Flood Control Zone.

The project would be constructed over a 2-year period commencing in the 2002 construction season. It is proposed that construction start in the lower reaches of the Project and proceed upstream. This schedule would provide the maximum amount of flood protection as soon as possible without inducing flooding downstream. The proposed schedule for the project is presented in Table 1-2 on the following page.

Table 1-2
Lower Guadalupe River Flood Protection Project
Implementation Schedule Milestones

Item	Completion Date
Plans and Specifications	May 2002
Advertise Construction Contract No. 1[1]	May-June 2002
Begin Construction Contract No. 1	August 2002
Complete Construction Contract No. 1	December 2004
Advertise Construction Contract No. 2[2]	November-December 2002
Begin Construction Contract No. 2	March 2003
Complete Construction Contract No. 2	December 2004

[1] Construction Contract No. 1 includes recommended flood protection improvements within District rights-of-way in Reaches A through G, plus the Baylands.

[2] Construction Contract No. 2 includes reconstruction of the eastbound State Route 237 Bridge at Guadalupe River, with related highway and channel improvements within Caltrans right-of-way.

CHAPTER 2
WATERSHED DESCRIPTION

This chapter provides characteristics and a description of the Guadalupe River Watershed and how it relates to the project area. Detailed technical information on the basin hydrology and physiography, the geological setting, and a summary of the environmental setting are discussed in the following sections.

2.1 Characteristics of the Watershed and Project Area

Located in the County, the Guadalupe River basin covers an area of approximately 414.4 square kilometers ([km^2]; 170 square mi). The river originates in the Santa Cruz Mountains, located southwest of San Jose, and drains northerly through the heavily populated Santa Clara Valley and into San Francisco Bay. Major tributaries of the Guadalupe River are Alamitos Creek, Guadalupe Creek, Canoas Creek, Ross Creek, and Los Gatos Creek. Basin relief is approximately 1,158 m (3,800 ft), with the highest point near Loma Prieta in the Santa Cruz Mountains and the lowest point near Alviso at San Francisco Bay (J&S 2000). The basin is characterized by a perimeter of high, steep, natural slopes with a large, wide valley below.

2.2 Study Area Description

The Lower Guadalupe River, between San Francisco Bay and I-880, can be divided into two distinct flow regimes, tidal and nontidal. The tidal zone extends upstream from the Bay 12,000 m (39,370 ft) to approximately Montague Expressway. The nontidal zone extends 5,600 m (18,373 ft) from Montague Expressway to I- 880. As the Guadalupe River enters the tidal zone, where its elevation is within the influence of Bay tides, its slope abruptly shallows, causing a decrease in sediment transport capacity that results in significant gravel deposition between Trimble Road and Montague Expressway. The tidal zone exhibits a continued reduction in channel slope with distance downstream and is characterized by tranquil low flow conditions with fine to very fine-grained bed and bank material. Typical cross sections show relatively flat, narrow strips of tidal marsh bordering the low flow channel, particularly downstream from Tasman Drive, whereas upstream sections have more irregular topography. The nontidal zone exhibits channel invert elevations above tidal influences and a steeper channel slope with higher energy conditions, reflected by the gravel bed material found in the low flow channel, small gravel bars, and occasional steep, eroded banks such as those observed upstream from the Airport Parkway Bridge (J&S 2000).

Vegetation is also affected by tidal conditions. In fresh water areas upstream from Montague Expressway, riparian woodland consisting largely of willow, cottonwood, and box elder is dominant. Fresh water marsh is found from Montague Expressway to the Hetch Hetchy pipeline crossing, characterized by abundant bulrushes, areas of cattails along the channel bottom and decreasing riparian tree cover. Levee banks are covered by weeds and grasses and occasional brush. Salt marsh species become increasingly apparent downstream from Hetch Hetchy, where cord grass and pickleweed compete with freshwater marsh species. Few, if any, trees are present in this area. Downstream from Tasman Drive, salt water species dominate and trees are absent (J&S 2000). Figures 2-1 through 2-8 are photographs of the LGRP area. The photographs include Reaches A through G and an aerial photograph of the Baylands Area.

2.3 Water Hydrology and Basin Physiography

The hydrology of the basin has been greatly altered by human activity. In 1929, the District was created to alleviate land surface subsidence in and around San Jose caused by groundwater overdraft. In 1933, the District initiated a construction program to build recharge ponds and four dams and reservoirs in the Guadalupe River basin. The dams forming Calero, Almaden, and Guadalupe Reservoirs were completed in 1935, and the dam forming Lexington Reservoir was completed in 1952. These reservoirs and recharge ponds were designed to capture winter rains to recharge groundwater aquifers. The reservoirs, shown in Table 2-1, currently have a combined storage capacity of 42.75 $m^3 \times 10^6$ (34,660 af). Although this storage capacity is primarily for water supply, there are some incidental flood protection benefits (SCVWD 1999).

Runoff and riverflow conditions have been greatly affected by reservoir operations and changes in land uses. Combined, the four District reservoirs control a sub-basin of 63 square miles, almost 40 percent of the watershed, and have a present storage capacity of 34,660 af. This capacity is used primarily for water supply, with some flood control benefits, although none of the reservoirs are operated for flood control purposes in the wet season. The non-regulated area of the watershed in Santa Clara Valley is largely urbanized and the Guadalupe River and its tributaries have been extensively channelized and leveed. The Guadalupe River reaches San Francisco Bay near Alviso where land use changes abruptly from densely urbanized municipal and residential areas to salt ponds and tidal marsh. The tidal influence of San Francisco Bay extends up the Guadalupe River to about the Montague Expressway. Tidal processes convey and redistribute sediments in the lower reaches of the river, forming marginal marsh surfaces adjacent to the low flow channel.

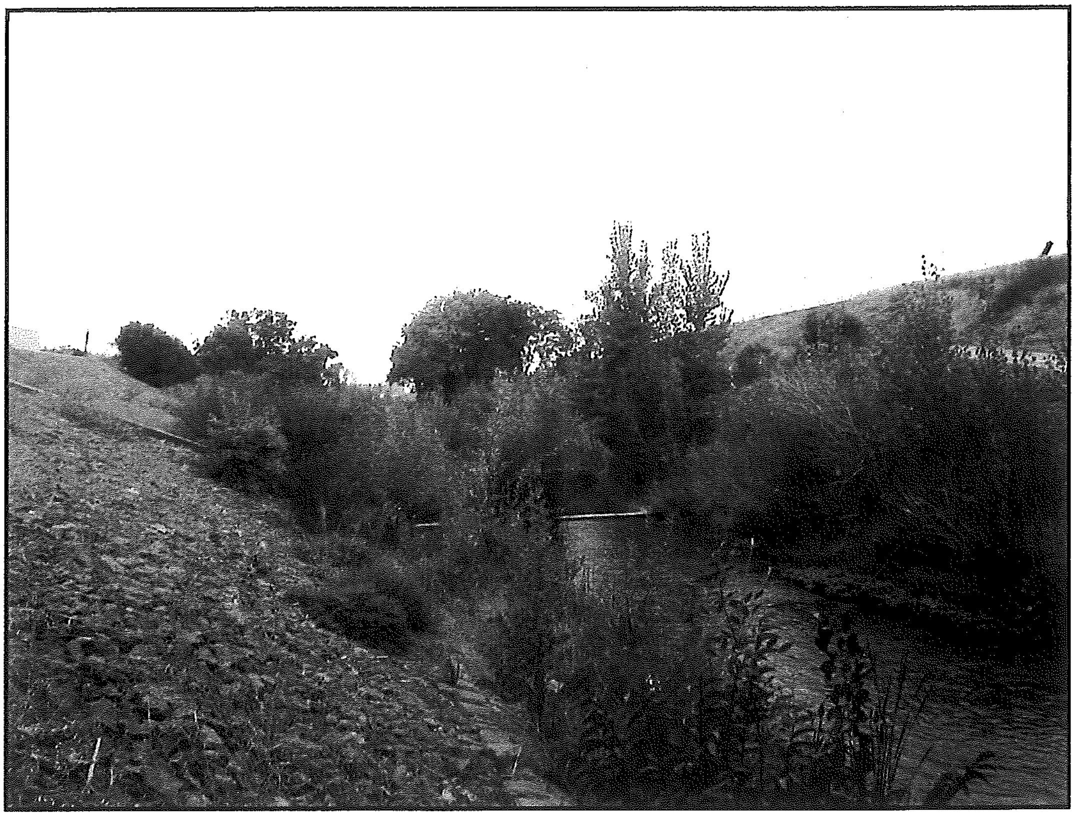
Table 2-1
District Reservoirs Located in Guadalupe River Watershed

Reservoir Name	Basin Area Above Reservoir Hectares (mi^2)	Year Built	Capacity $m^3 \times 10^6$ (af)
Lexington	9,583 (37)	1952	24.46 (19,830)
Guadalupe	1,554 (6)	1935	3.98 (3,230)
Almaden	3,108 (12)	1935	1.91 (1,550)
Calero	2,072 (8)	1935	12.40 (10,050)
Vasona	1,373 (5.3)	1968	0.5 (400)
			43.25 (35,060)

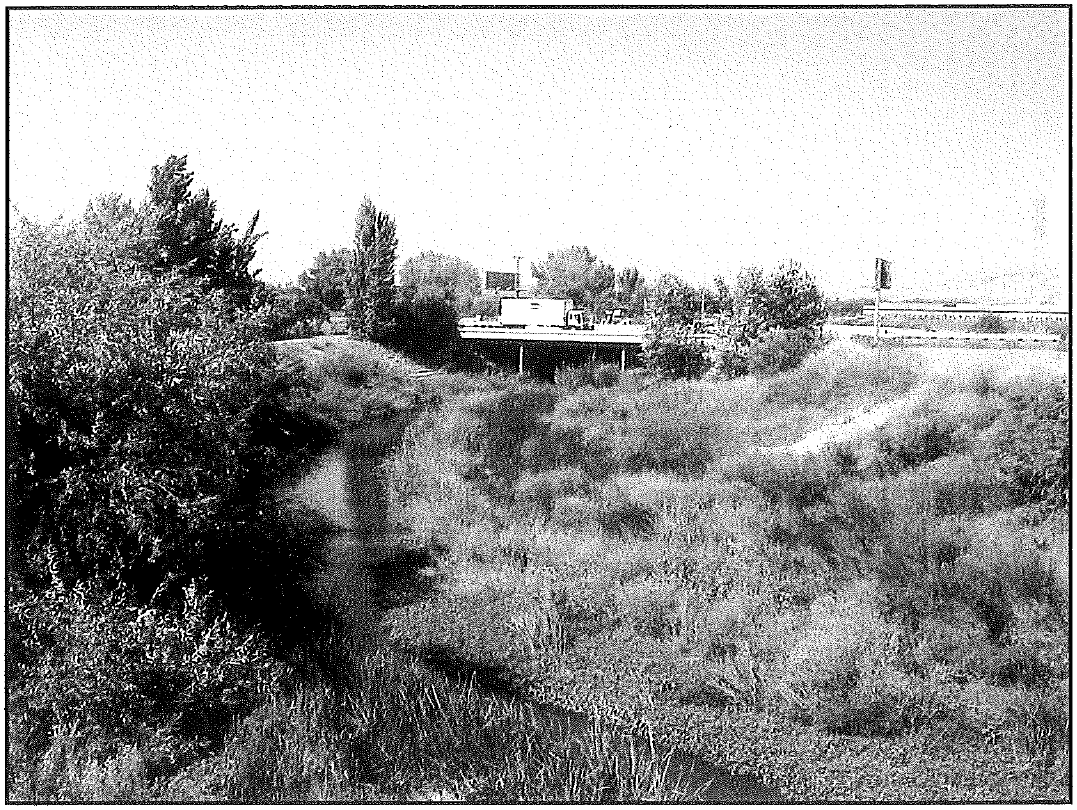
2.3.1 Precipitation

The climate of the Santa Clara Valley is characterized by warm, dry summers and mild, moderately wet winters. Summer weather is dominated by sea breezes caused by differential heating between the interior valleys and the coast, while winter weather is dominated by storms from the northern Pacific Ocean that produce nearly all the annual rainfall.

Precipitation data are available from numerous rain gauge stations in the Guadalupe River basin, some of which have been in operation for approximately 100 years. Records from precipitation gauges located near Los Gatos 12 km (7.5 mi) southwest of downtown San Jose, in San Jose, and at Santa Clara University (approximately 4 km [2.5 mi] west of downtown San Jose) date back approximately 100 years. The average annual precipitation varies from less than 356 millimeters (mm; 14 inches [in]) near San Francisco Bay and 356 mm (14 in) in San Jose to more than 1,100 mm (44 in) near the crest of the Santa Cruz Mountains (Figure 2-9). The average annual precipitation for the Guadalupe River basin as a whole is about 508 mm (20 in). Ninety percent of the rainfall occurs in the late fall and winter months; January is usually the wettest month (Table 2-2).

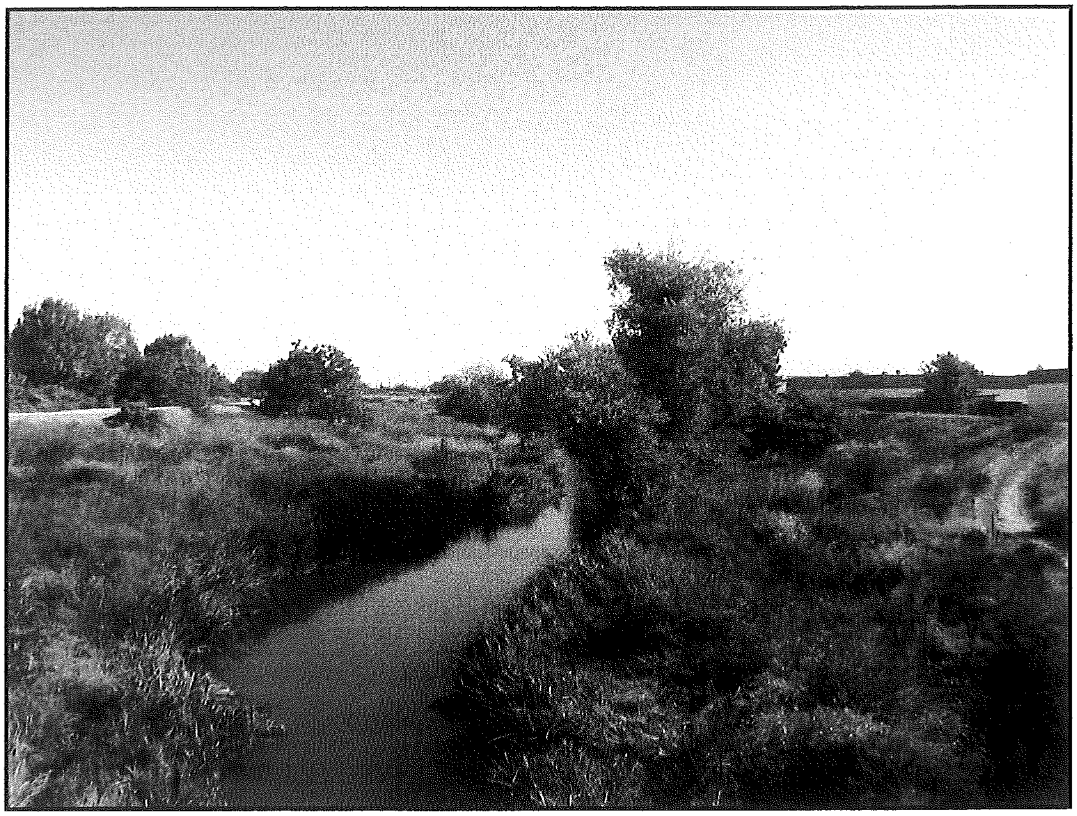


Looking downstream from west depressed maintenance road at I-880.

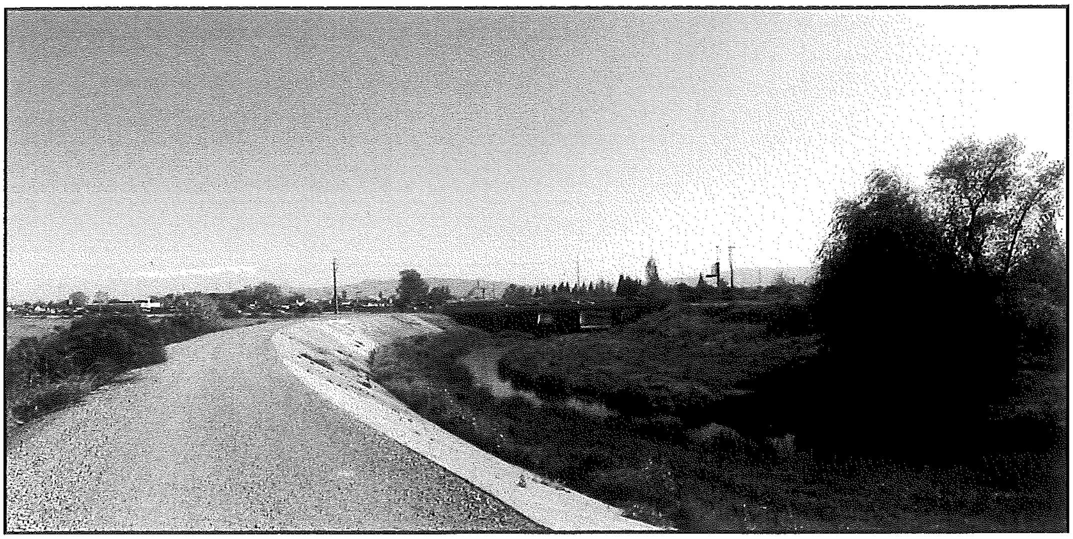


Looking downstream at Highway 101 Bridge.

Figure 2-1
Reach A Photos
Lower Guadalupe River Project



Looking upstream from Trimble Road Bridge.

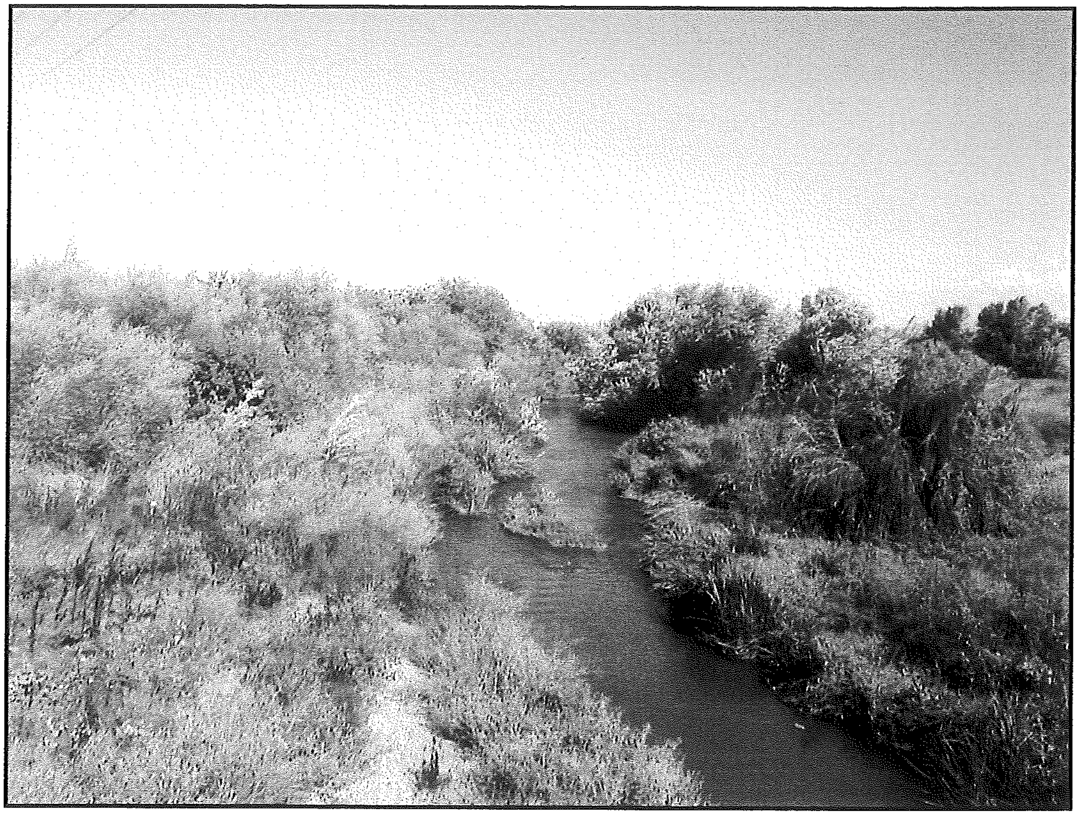


Looking upstream at east levee and Highway 101 Bridge.

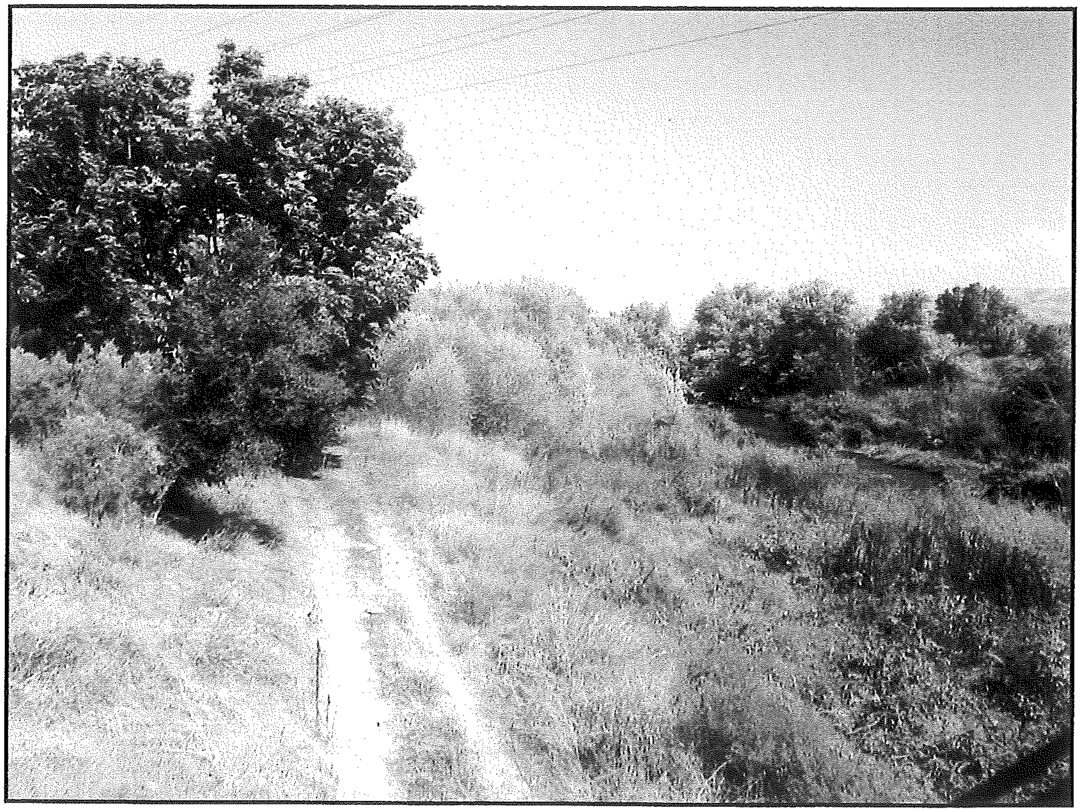
Figure 2-2

Reach B Photos

Lower Guadalupe River Project

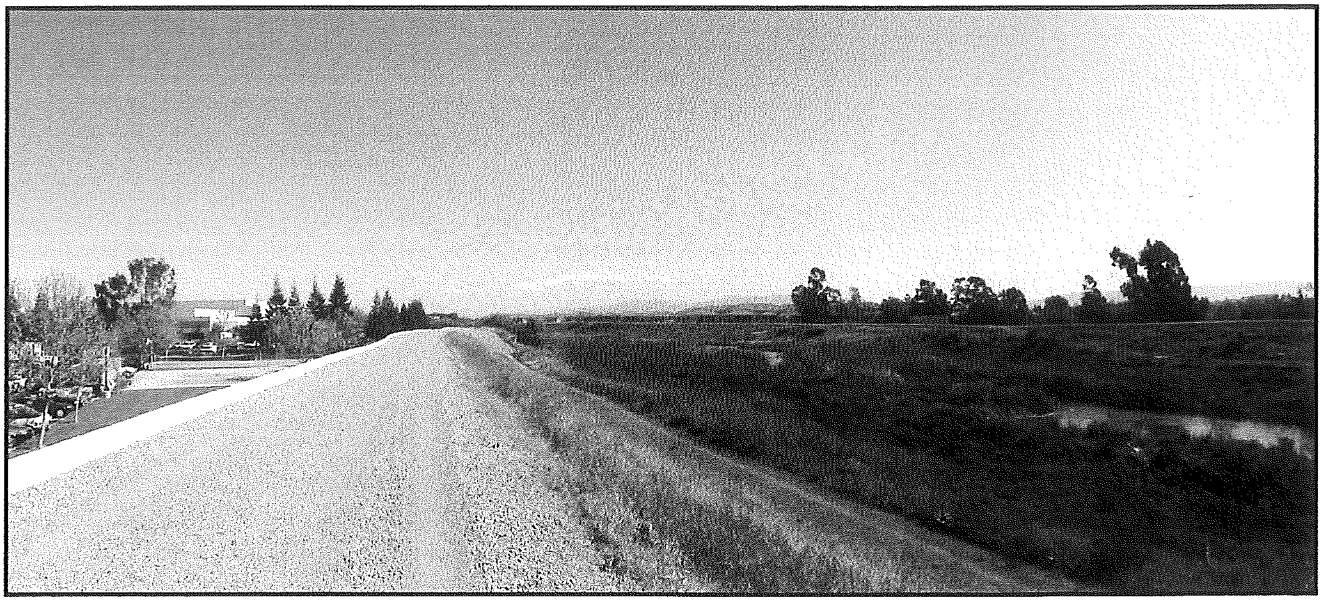


Looking upstream from Montague Expressway Bridge.

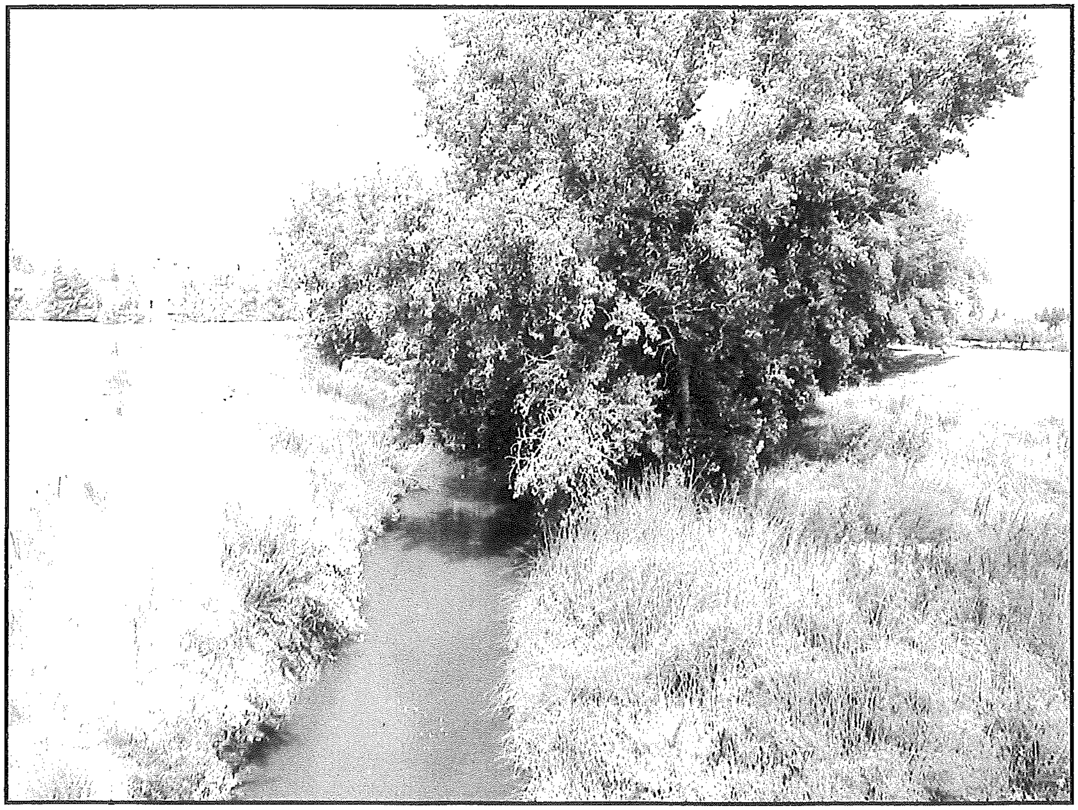


Looking downstream at west levee and depressed maintenance road from Trimble Bridge.

Figure 2-3
Reach C Photos
Lower Guadalupe River Project

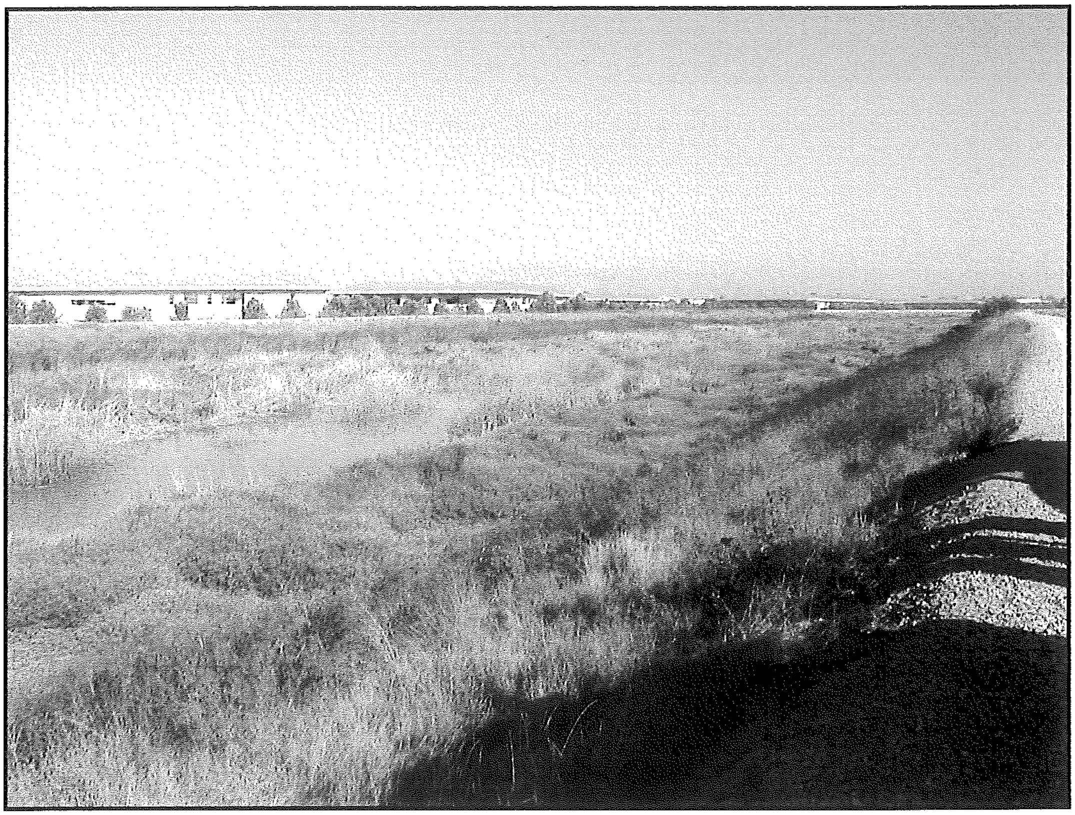


Looking upstream from Hetch Hetchy.

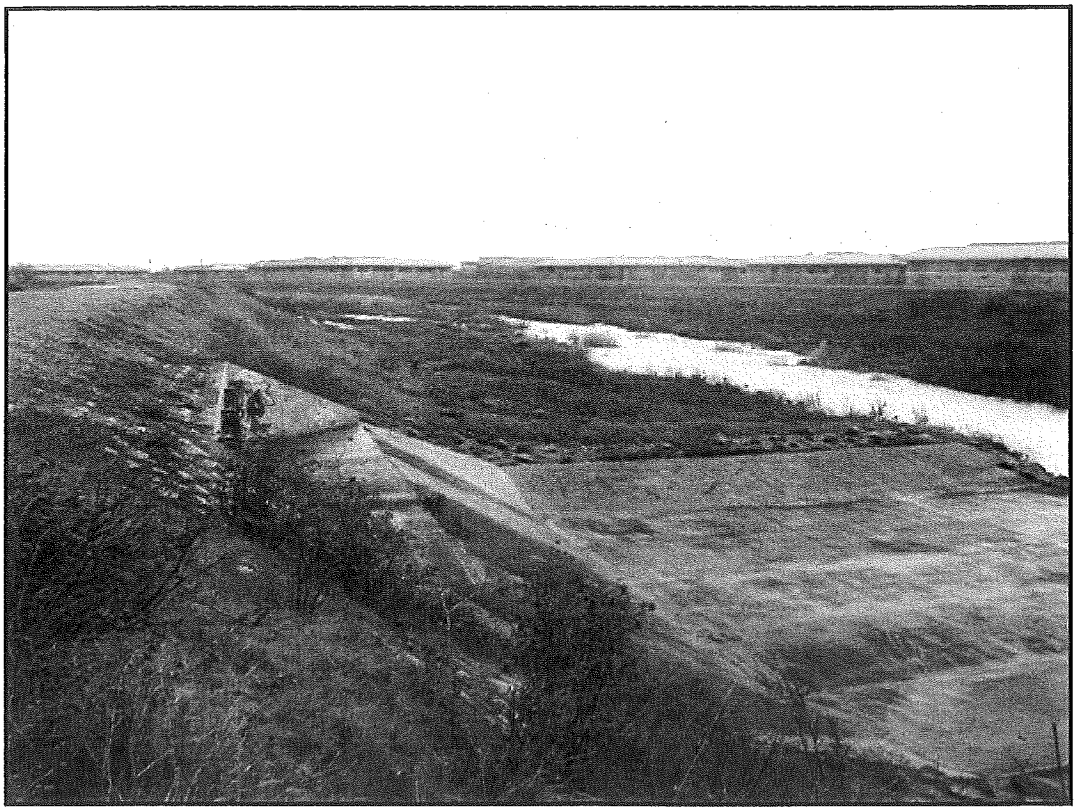


Looking downstream from Montague Expressway Bridge.

Figure 2-4
Reach D Photos
Lower Guadalupe River Project



Looking upstream at west levee from Tasman Bridge.

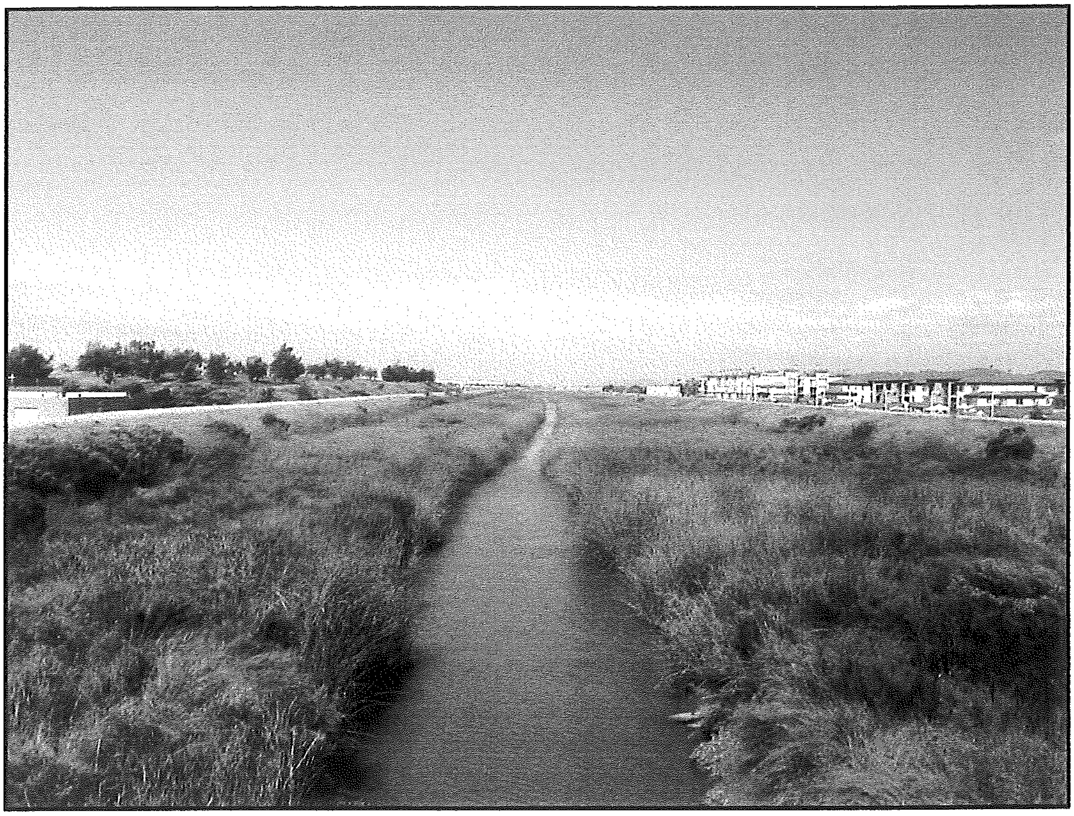


Looking downstream at the pump station outfall on west levee at Hetch Hetchy pipeline crossing.

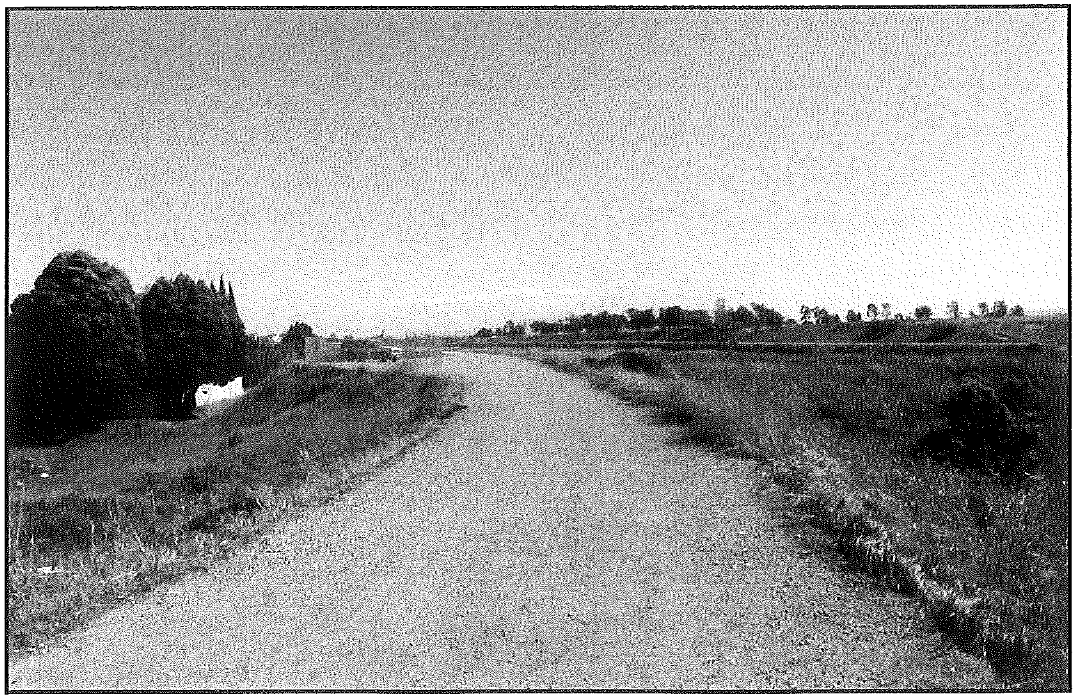
Figure 2-5

Reach E Photos

Lower Guadalupe River Project



Looking downstream from Tasman Drive Bridge.

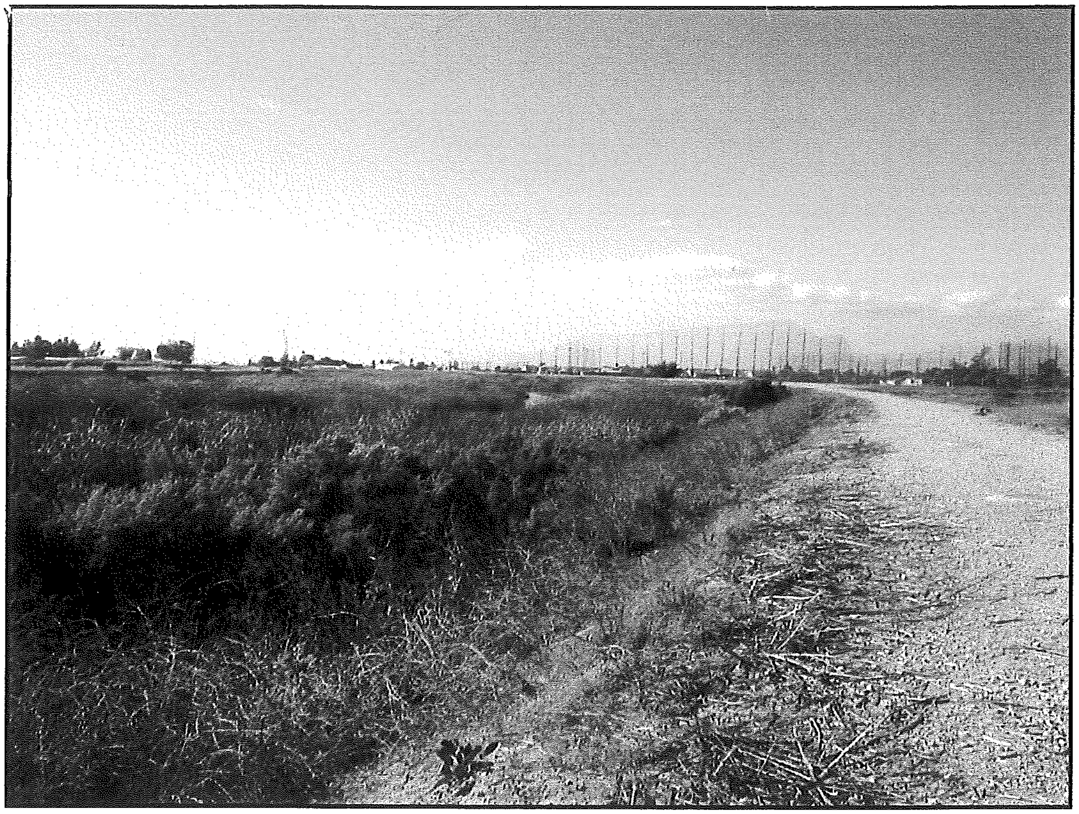


Looking upstream at east levee from Highway 237 Bridge.

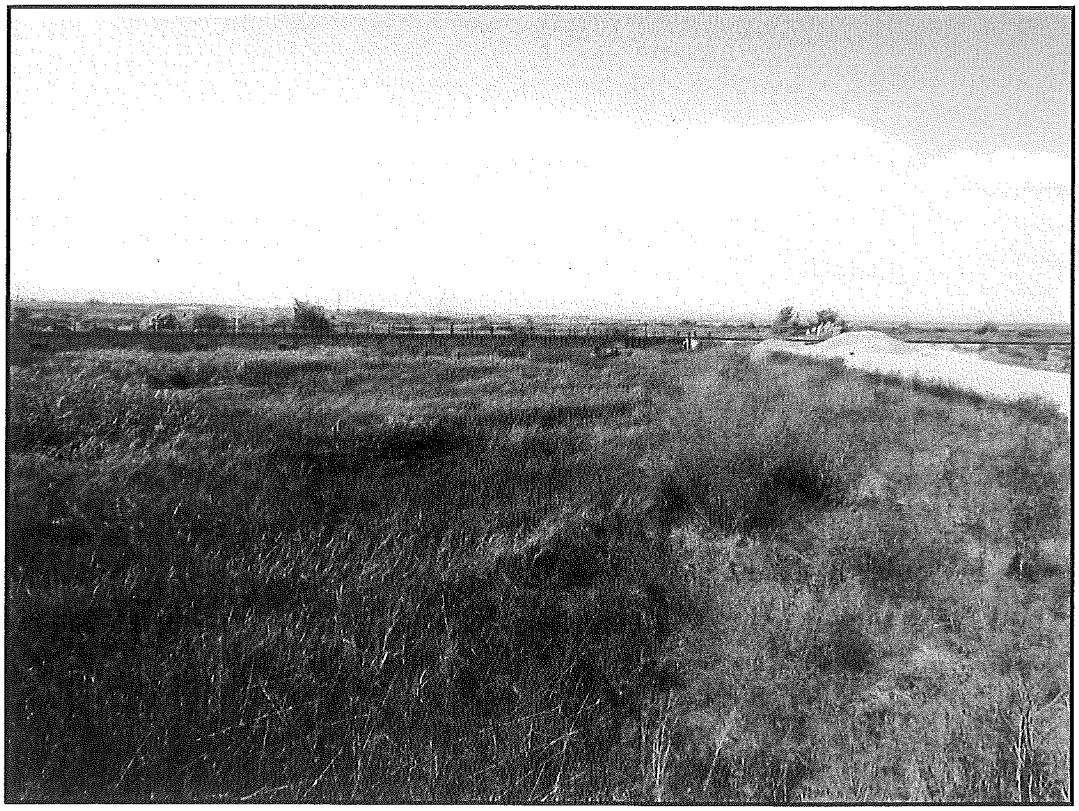
Figure 2-6

Reach F Photos

Lower Guadalupe River Project



Looking downstream along east levee from Highway 237 Bridge.



Looking downstream at UPRR Bridge from Gold Street Bridge.

Figure 2-7
Reach G Photos
Lower Guadalupe River Project

CH2MHILL

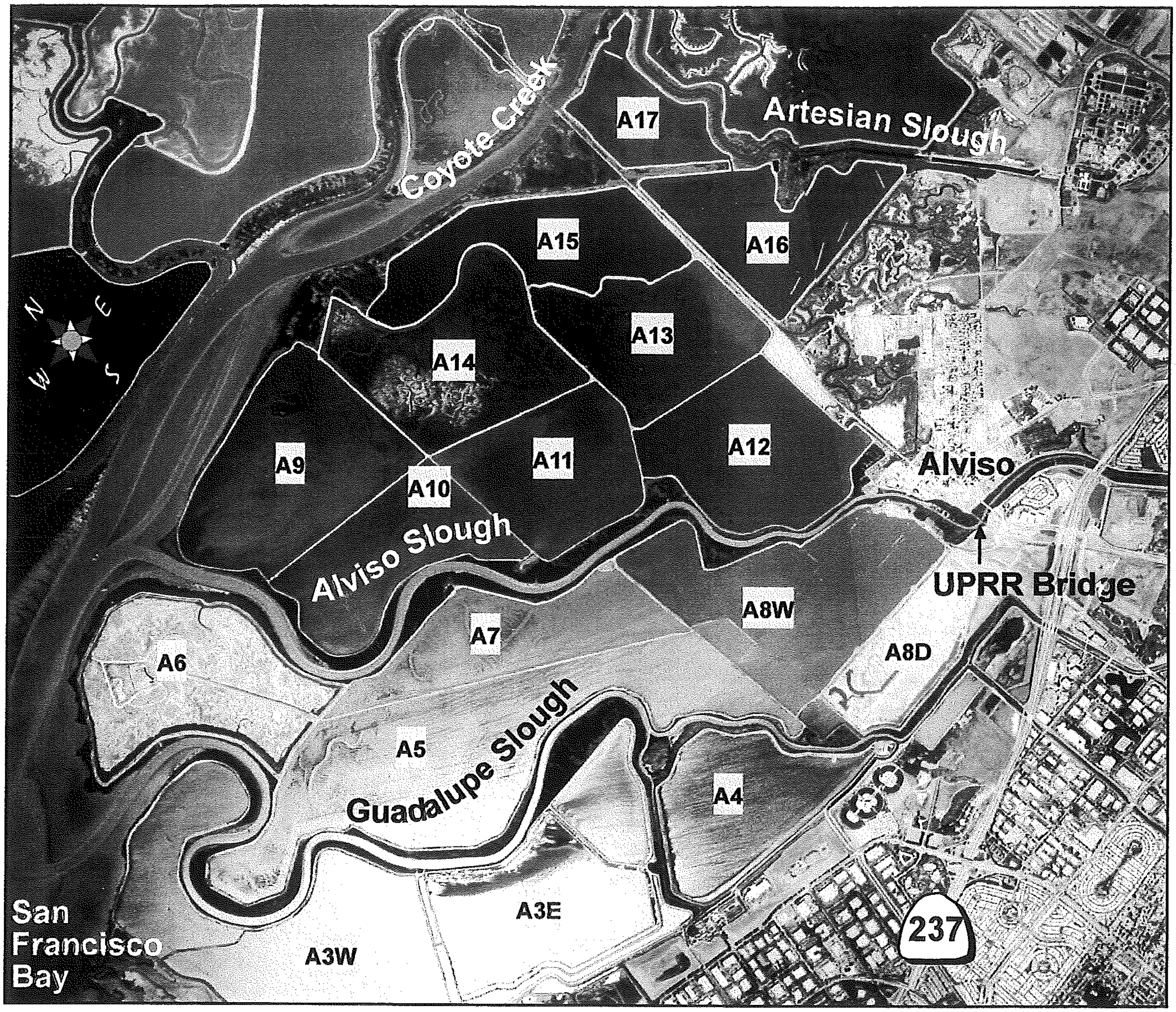


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Figure 2-8
Baylands Aerial Photo
Lower Guadalupe River Project

CH2MHILL

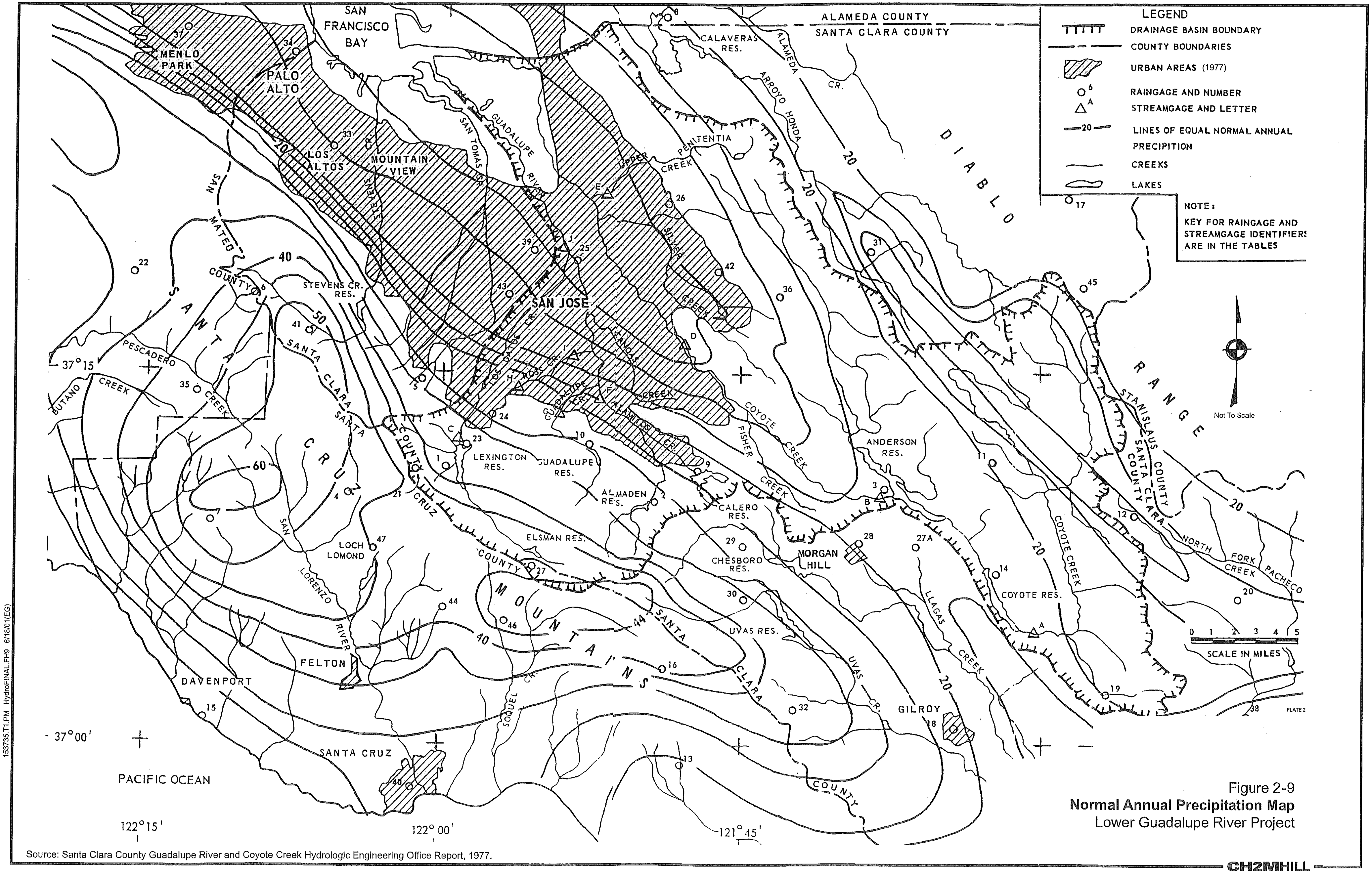


Figure 2-9
Normal Annual Precipitation Map
Lower Guadalupe River Project

Source: Santa Clara County Guadalupe River and Coyote Creek Hydrologic Engineering Office Report, 1977.

153735.T1.PM HydroFINAL.FH9 6/18/01(EG)

Table 2-2 shows that January and December are normally the wettest months of the year in the Guadalupe River basin.

Table 2-2
Distribution of Monthly Average Precipitation for the Guadalupe River Basin

Month	Monthly Precipitation (Percent of Normal Annual Precipitation)	Month	Monthly Precipitation (Percent of Normal Annual Precipitation)
January	21.1	July	0.1
February	16.5	August	0.2
March	14.0	September	0.9
April	8.7	October	4.7
May	2.4	November	11.9
June	0.4	December	19.1

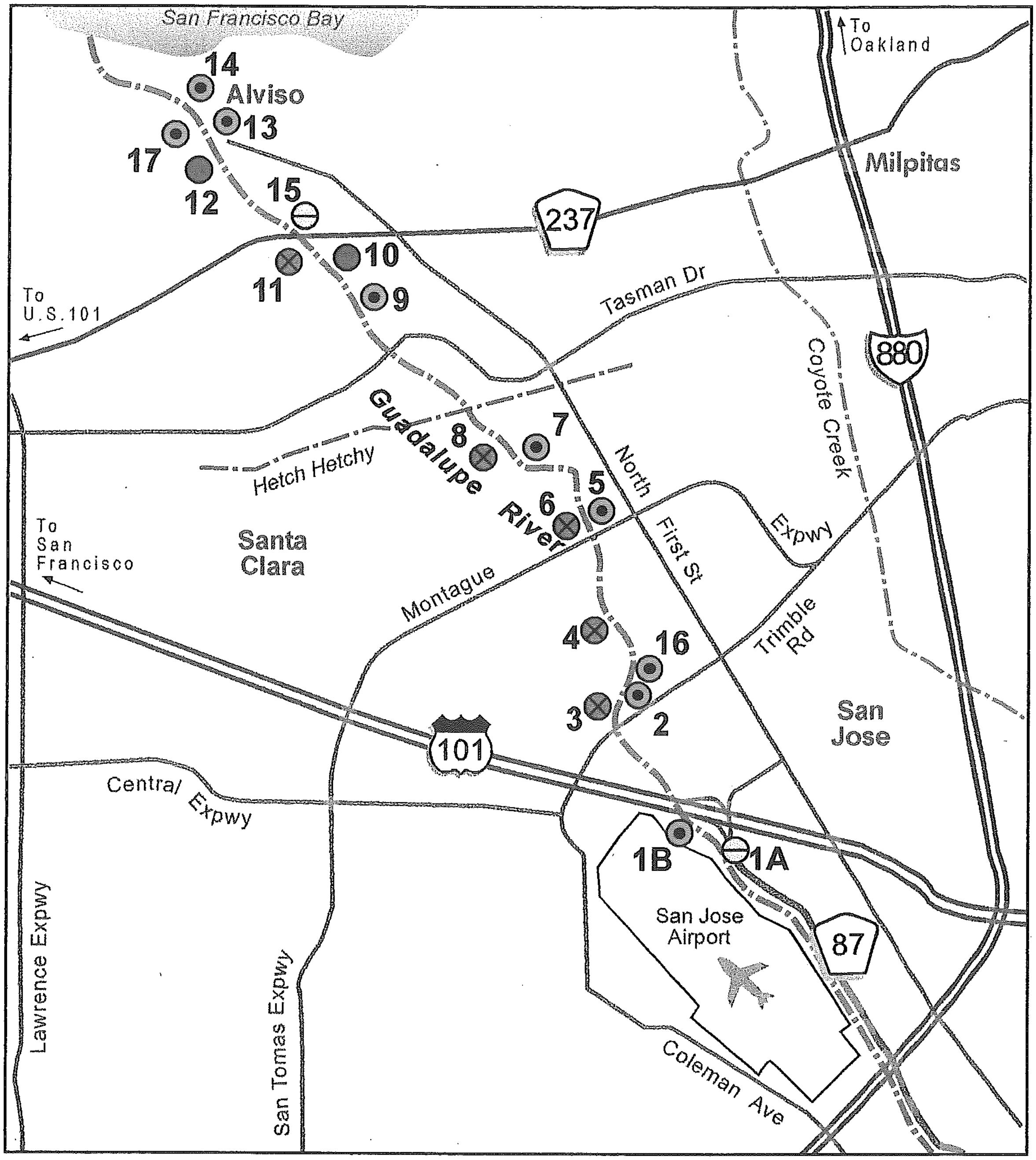
Source: U.S. Corps of Engineers 1991b.

2.3.2 Existing Runoff and Drainage

The average annual natural runoff in the Guadalupe River at the San Jose gauge for the period 1931 to 1960 is estimated to be 43.85 m^3 x 10^6 (35,500 af; Corps 1991a). Runoff during this period ranged from zero m^3 (0 af) in 1931, to more than 151.73 m^3 x 10^6 (123,000 af) in 1938, which is the wettest year on record (U.S. Geological Survey [USGS] 1999). Historically, the Guadalupe River has experienced significant flow fluctuations in response to the distinct wet and dry seasons. Virtually all surface runoff in the Guadalupe River basin occurs during the 5-month period from December through April (refer to Table 2-2).

Low-flow conditions in the tributaries and mainstems of the Guadalupe River have been modified by land use changes, imported water, reservoirs constructed in the upper portions of the basin, and hazardous materials cleanup programs upstream from the project area.

In general, urbanization and the associated increase in impervious surfaces in the form of residential, industrial, and commercial development tend to increase the rates and total quantities of runoff generated within the drainage basin. Figure 2-10 shows the location of pump stations within the project area, which discharge storm water from the Cities of San Jose and Santa Clara, and Caltrans facilities. Irrigation return flows to the tributary creeks and river from agricultural and residential water uses also increase summer flows.



Pump Stations

1A	Airport Parkway Station (10.5 cfs)
1B	Airport (50 cfs)
2	Gateway (7 cfs)
3	Laurelwood & Victor (131 cfs)
4	Nelo & Victor (60 cfs)
5	Rincon (360 cfs)
6	Lick Mill (234 cfs)
7	River Oaks (67 cfs)
8	Fairway Glen (247 cfs)
9	Oakmead (735 cfs)
10	Oakcrest Estates (12 cfs)
11	East Side (111 cfs)
12	Summerset (21 cfs)
13	Alviso Pump Station 12 (0.2 cfs)
14	Elizabeth & Gold St. (45 cfs)
15	N. First Street (72 cfs)
16	Rincon 2 (600 cfs) (Proposed)
17	Alviso Pump Station 13 (? cfs)

Ownership

- ◉ City of San Jose
- ⊗ City of Santa Clara
- ⊖ Caltrans
- ● Private

N

0 5280

1000 4000

Scale In Feet

Figure 2-10

Approximate Locations of Known and Proposed Pump Stations

Lower Guadalupe River Project

CH2MHILL

153735.T1.PM PumpStationsFINAL.FH9 7/18/01(DVR)

Flows on the Guadalupe River have been altered since the late 1800s as a result of early agricultural development in the Santa Clara Valley (Hall 1871). Flows were further altered after 1935, when Calero, Guadalupe, and Almaden Reservoirs were completed near the river's headwaters and when Lexington Reservoir was completed in 1952. These reservoirs were designed to capture winter rains for groundwater recharge programs, but they are also operated to meet the instream flow requirements. Generally these instream flow requirements are based on the needs of other water rights holders, such as water supply and agricultural users, as well as the needs of fish populations, recreation, and other public trust resources. Flow requirements are adjusted to take into account evaporation and channel losses.

Upstream from the project area, groundwater recharge ponds are located along the Guadalupe River approximately 7.2 km (4.5 mi) upstream from I-280 and along Guadalupe Creek. Water is released from the reservoirs for diversion into the recharge ponds and to allow groundwater recharge through the streambeds. When the water released from the reservoirs exceeds the recharge capabilities of the recharge ponds and the streambeds, the surplus water flows down the Guadalupe River to the project area.

Flows in the Guadalupe River are also indirectly affected by water imported from the Sacramento-San Joaquin River Delta and the Coyote Creek basin. The imported water is delivered to the reservoirs or directly to the recharge ponds via the South Bay Aqueduct of the State Water Project (SWP), the San Felipe Division of the Central Valley Project (CVP), and Anderson Reservoir in the upper Coyote Creek basin.

The District entered into a contract with the SWP in 1961 to deliver 123.36 m^3 x 10^6 (100,000 af) of water per year (SCVWD 1999). The first deliveries of SWP water were made in 1965. The amount of water delivered each year depends on the amount allocated by the California Department of Water Resources. This amount is based on the water year type. Construction of the San Felipe Division of the CVP was completed in 1979 for the purpose of delivering water and augmenting existing municipal water supplies for the San Francisco Bay region and surrounding areas. The District began receiving San Felipe water in 1987 and has been receiving 50 to 75 percent of the annual CVP allotment of 187.51 m^3 x 10^6 (152,000 af; U.S. Bureau of Reclamation 1994). Because SWP and CVP water is diverted into the previously identified reservoirs or directly to the groundwater recharge basins, some surplus water may flow down the Guadalupe River to the LGRP area (Corps 1991b). However, because the District's operational goal is to release only the quantity of water that can be effectively recharged, the effects on streamflow of importing up to 310.87 m^3 x 10^6 (252,000 af) of water are negligible downstream from the recharge ponds.

From 1983 through 1991, between 3.33 and 19.73 m^3 x 10^6 (2,700 and 16,000 af) of water per year were added to the Guadalupe River upstream from the project area. This water came from groundwater pumping conducted as part of a hazardous waste cleanup program at the IBM and Fairchild properties along Canoas Creek. Groundwater was pumped from contaminated areas, and pollutants, consisting of various organic compounds, were mechanically removed from the recovered water. The water was then discharged to Canoas Creek.

In summary, reservoir releases to satisfy the instream flow requirements, groundwater recharge pond capacities, and irrigation and drainage return flows have resulted in altered, and generally higher, flows during the summer months than historically experienced. Table 2-3 shows the monthly distribution of mean daily flows in the Guadalupe River at the USGS San Jose gauge near the St. John Street Bridge, for the period of record from water year 1954 through water year 1998. The median (50th percentile) daily streamflows in the low flow months of May through October have been historically in the range of 0.03 cms (1 cfs) or less. This means that one-half of the mean daily flows between May and October have been less than 0.03 cms (1 cfs) and one-half have been greater than 0.03 cms (1 cfs).

The median (50th percentile) daily streamflows in the low-flow months of May through October have historically been approximately 0.03 cms (1 cfs) or less.

Table 2-3

Monthly Distribution of Mean Daily Flows (cfs) in the Guadalupe River at the USGS Guadalupe River at San Jose Gauge Water, 1954 through 1998

Percentile[a]	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	1	0	0	0	0	0	0	0
30	0	0	0	2	3	2	1	0	0	0	0	0
40	0	1	1	4	6	5	3	1	0	0	0	0
50	1	2	4	8	15	16	5	2	1	1	1	0
60	2	4	8	18	25	31	15	3	2	2	1	1
70	4	8	16	28	61	74	23	6	4	3	2	2
80	8	19	25	82	173	157	54	19	12	10	8	8
90	17	36	73	310	230	409	184	27	21	17	19	17
100	2,460	1,140	4,490	4,460	6,632	7,870	5,150	972	206	104	160	276

[a] Percent of mean daily flows less than the indicated amount.

Source: U.S. Geological Survey 1998

2.3.3 Minimum Flow Releases

The District does not have strict minimum flow release rates for the reservoirs in the Guadalupe River basin (Aguilera, pers. comm). The District's reservoir releases are governed by water distribution and recharge capacities, allotments to downstream water rights holders, the requirement to maintain fish populations under CDFG Code Section 5937, and flood control release rules. Because the purpose of reservoirs is to store winter runoff to recharge the groundwater that provides potable water supplies to the Santa Clara Valley, the District's operational goal is to release water that only can be used in its recharge operations or to meet the mandated instream flow requirements.

The District is required to release all natural inflows to the reservoirs outside of their diversion periods to provide riparian water rights holders their water entitlement (Aguilera, pers. comm.). The periods when the District is allowed to capture water in the reservoirs are as follows:

Almaden Reservoir	December 1 through April 30
Calero Reservoir	December 1 through April 30
Guadalupe Reservoir	December 1 through April 30
Lexington Reservoir	November 1 through May 15

The District is required by Section 5937 of the CDFG Code to maintain fish in "good" condition below its dams. To meet this requirement, while also maximizing its groundwater recharge capabilities, the District attempts to keep the creeks wet below the dams to at least the point where streamflows can be augmented by other sources. As a general guideline, this requires a minimum flow of approximately 0.085 cms (3 cfs) from Guadalupe Dam; approximately 0.057 cms (2 cfs) from Calero Dam, approximately 0.085 cms (3 cfs) from Almaden Dam; and approximately 0.085 (3 cfs) from Lenihan Dam, which is the dam that creates Lexington Reservoir. However, additional releases from either of the reservoirs or the other sources are required to maintain flows in the creeks to their confluence with the Guadalupe River. For example, when releases from Calero Reservoir to Arroyo Calero are at the minimum level, the District needs to augment the flow with increased releases from Almaden Reservoir to Alamitos Creek to maintain a flow below the confluence of these two streams that would reach the Guadalupe River. The minimum flows indicated previously would provide flow only to the confluence of the Alamitos Creek with Arroyo Calero; additional releases from either Calero or Almaden Reservoir would be required to maintain flows to the confluence with the Guadalupe River.

The District also releases water from the reservoirs to prevent overtopping of the emergency spillways of the dams. Flood release operating rules, or curves, have been developed for each reservoir. Water is released from the reservoirs based on storage levels, rates of inflow, and weather forecasts to prevent uncontrolled spilling that could damage the dams. Although the flood release curves may provide some incidental flood protection to the valley floor, their primary purpose is to protect the safety of the dams. When the reservoirs are full, excess water is spilled in to the Guadalupe River and its tributaries.

2.3.4 Calculation of the Design Flood Flow Rate

The study area design flow rate was taken from the hydrologic studies conducted by the Corps in the late 1970s (Corps 1977), which resulted in a design flood hydrograph with an instantaneous peak flow of 481 cms (17,000 cfs).

Additional flows (above 481 cms) caused by the storm water pump station discharges into the Lower Guadalupe River from the Cities of San Jose and Santa Clara and Caltrans facilities are not included in the design flow rate. These storm water pump discharges will be allowed into the Lower Guadalupe River in accordance with the Emergency Operations Plan (EOP) developed by the District and the pump station owners, to manage flows when the Lower Guadalupe River begins to reach design capacity. Table 2-4 summarizes the potential additional cumulative flows estimated from all pump stations downstream from Highway 101 to UPRR. Table 2-4 presents the potential flow at each of the listed locations assuming pumped inflow would be allowed to enter the Lower Guadalupe River. The recommended alternative, described in Chapter 5, is being designed for only the Guadalupe River design flood flow at I-880; 481 cms (17,000 cfs).

Table 2-4
Flow Rate and Locations

Location	Flow Rate cms (cfs)
Guadalupe River Downstream of Los Gatos Creek	481 (17,000 cfs)
Guadalupe River Downstream of Highway 101	510 (18,000 cfs)
Guadalupe River Downstream of Montague Expressway	538 (19,000 cfs)
Guadalupe River Downstream of Tasman Drive	566 (20,000 cfs)

Currently a pump EOP is being developed in coordination with Caltrans, the City of San Jose and the City of Santa Clara to address interior drainage issues during flood events. Interior drainage behind the existing levees is provided by a series of pumps that discharge directly to the Lower Guadalupe River. These pumps are located at intervals between I-880 and Alviso and range in individual capacity from 7 cfs to 735 cfs, with an aggregate capacity of approximately 3,000 cfs (Figure 2-10).

2.4 Geological Setting

The Lower Guadalupe River extends from the northerly end of the Santa Clara Valley in Alviso to nearly the heart of the Valley just north of downtown San Jose; the LGRP area lies between the Santa Cruz mountains to the west and the Diablo Range to the east.

> The Santa Clara Valley is a broad northwesterly trending alluvial filled basin. The older Mesozoic rocks of the Santa Cruz mountains and the Diablo Range underlie the thick accumulations of alluvial sediments in the Santa Clara Valley. These alluvial sediments are divided into the lower older Santa Clara Formation, and the upper younger surficial deposits of alluvium, and alluvial fans (URS Greiner 2000). The Santa Clara Valley is located in a structural depression of the Coast Range that has slowly infilled with sediments, creating a broad alluvial valley floor with deposits several tens of meters thick (Norris and Webb 1990). The earliest of these deposits in the South San Francisco Bay area date from the early Pleistocene, about 1.5 million years ago (mya; Atwater et al. 1977). Detailed discussions of deposits and sedimentary facies in the Santa Clara Valley are provided by Helley and Lajoie (1979).[1]

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[1] From Northwest Hydraulic Consultants. 1998. Lower Guadalupe River Sedimentation Study prepared for Santa Clara Water Valley District.

Rocks in the upper Guadalupe River basin are highly sheared and faulted, typical of the geologically fractured and seismically active Coast Range. The San Andreas Fault borders the western edge of the basin and the Hayward and Calaveras Faults lie to the east. Numerous other unnamed faults also cross through the basin (DMG 1992), all of them in a southeast and northwest orientation that follows the structural alignment of the Coast Range. Rock types consist primarily of sedimentary rocks of the Franciscan Complex, volcanics and metavolcanics, and ultramafic rocks whereas the lower basin is composed of Quaternary alluvium, some of it partially consolidated. The South San Francisco Bay and Guadalupe River estuary contains high concentrations of fine-grained bay muds though they do not achieve appreciable thicknesses until 6.44 to 8.05 km (4 to 5 mi) downstream from Alviso (Goldman 1969).

2.5 Summary of Environmental Setting

Documentation of the existing environmental conditions for the Lower Guadalupe River is provided in the EIR. The EIR documents the existing land use, biological resources (terrestrial and aquatic habitat), cultural resources, hazardous materials and public utilities, as compiled from available sources and field reconnaissance. Limits of the resource areas and the utility locations were compiled into the LGRP geographic information system (GIS) database. The findings are summarized below.

2.5.1 Land Use

The LGRP area is within the city limits of San Jose and Santa Clara. Commercial, industrial, single-family residential, and multi-family residential development exists immediately outside the Guadalupe River rights-of-way, for most of the LGRP alignment. A limited number of undeveloped parcels do exist along the corridor, though they are discontinuous, relatively small, or both. The LGRP EIR includes a detailed description of land uses adjacent to the project and relevant land planning documents and policies.

2.5.2 Biological Resources

There are 125.5 acres of terrestrial habitat in the LGRP corridor, and 104.1 acres of aquatic habitat. The terrestrial habitat is comprised of riparian forest, riparian shrub, ruderal scrub, ruderal herbaceous, and ornamental landscaping. The latter is comprised of perennial wetlands, seasonal wetlands, and open water. The aquatic habitat areas are typically regulated areas that require approvals if they are to be disturbed, and often require mitigation as compensation when they are disturbed. These wetland areas cover nearly all the area between the base of the existing levees downstream of the Hetch Hetchy pipeline, and then generally become less extensive proceeding upstream. Formal acceptance of the delineation of jurisdictional wetlands in the LGRP area has been received from the Corps. Special-status plant and wildlife species have been identified as possibly occurring in the Lower Guadalupe River. Avoidance of these species and their habitats, and/or mitigation of any effects upon them by the proposed project, is documented in the LGRP EIR.

2.5.3 Cultural Resources

Twelve known archeological sites have been identified adjacent to or near the Lower Guadalupe River. Many of these sites have been disturbed and/or buried by past activities in the project area, and therefore their locations and extents have not been identified definitively. The LGRP EIR and Woodward Clyde Report include specific information on cultural resources in the LGRP area and proposed mitigation.

2.5.4 Hazardous Materials

The Level II Hazardous Material Investigation Report (Kleinfelder 1999 and 2000) provides a preliminary evaluation of the affected soil and groundwater within and adjacent to the Lower Guadalupe River. The report is primarily based on existing available data, and also was based on the assumption that the LGRP would consist of levee widening or raising, channel deepening, creation of ponds, or creation of wetland areas. Thirteen properties with high probability of containing some amount of hazardous materials were identified, and five properties were identified as probably containing some hazardous materials. Nine properties were identified as probably not containing hazardous materials, and 10 property owners denied access to the District for performing investigations. The LGRP EIR includes specific information on hazardous materials and their proposed handling.

2.5.5 Public Utilities

Information on existing utilities in the LGRP corridor have been compiled. There are an extensive number of public utilities along the corridor, owned and operated by numerous entities. Most noteworthy is the Hetch Hetchy pipeline, in Reach D, although there are numerous other large storm drain pump outfalls, sanitary sewer siphons, fiber optic, gas and other pipes that will require protection or relocation as part of this project. Table 2-5 summarizes existing utility database information. Under the "comment" column in Table 2-5, three categories of activities are proposed to accommodate the recommended project (see Chapter 5). "PROTECT IN PLACE" indicates that the utility would not require relocation or modification, but only adequate protection measures and caution exercised by the construction contractor. "MINOR" typically applies to small diameter (450 mm [18 inch] or less) culverts, or similar facilities, that would require limited structural modifications to accommodate the recommended project. "MAJOR" indicates large diameter (greater that 450 mm [18 inch]) culverts, pump station outfalls or similar facilities that would require complete relocation, reconstruction or substantial modifications, such as new headwalls, gates, or riprap installation to accommodate the recommended Project.

TABLE 2-5
Existing Utility Database Information

Type	Station	Size	Description	Owner	Comment
REACH G					
Bridge - UPRR	7+0087				
Storm Drain Outfall	07+090	900 mm (36")	Alviso Pump Station Outfall	City of San Jose	MAJOR: Replace to clear floodwall
Bridge - Gold Street	7+114				
Sanitary Sewer	07+104	100 mm (4") CID	4ACP Forced	City of San Jose	PROTECT IN PLACE
Powerline	07+104	--	Overhead Powerline	PG&E	PROTECT IN PLACE
Powerline	07+184	--	Overhead Powerline	PG&E	PROTECT IN PLACE
Pump Station	07+109	--	Alviso Pump Station (No. 12) West Bank	City of San Jose	PROTECT IN PLACE
Possible Pump Station	07+209	--	Alviso Pump Station (No. 13) South of Liberty East Bank	City of San Jose	PROTECT IN PLACE
Storm Drain Outfall	07+209	100 mm (4")	Alviso Pump Station Outfall	City of San Jose	MINOR: Shorten outfall through floodwall
Storm Drain Outfall	07+251	250 mm (10")	RCP	City of San Jose	MINOR: Shorten outfall through floodwall
Powerline	07+276	--	Overhead Powerline	PG&E	PROTECT IN PLACE
Storm Drain Outfall	07+424	525 mm (21")	CMP	City of San Jose	MAJOR: Clear floodwall
Pump Station	07+695	--	Summerset Mobil Home Pump Station (No. 11)	City of San Jose	NOT TO BE DISTURBED

Note 1: Invert elevations and/or dimensions are not available.

Type	Station	Size	Description	Owner	Comment
Storm Drain Outfall	07+695	1200 mm (48")	Summerset Mobil Home Pump Station Outfall	Private	PROTECT IN PLACE
Storm Drain Outfall	07+917	1200 mm (48")	Drain Outfall	–	MAJOR: Extend/new headwall/hardscape
REACH F					
Water Pipeline	08+000	300 mm (12")	Water Pipeline	–	PROTECT IN PLACE
Bridge - Highway 237	8+025				
Reclaimed Water	08+094	400 mm (16")	Reclaimed Water	City of Santa Clara	MAJOR: Replace
Pump Station	08+096	--	East Side Pump Station No. 10 - 3.14cms (111 cfs)	City of Santa Clara	NOT TO BE DISTURBED
Storm Drain Outfall	08+093	600 mm (24")	East Side Pump Station Outfall	City of Santa Clara	MAJOR: Extend/new headwall/hardscape
Storm Drain Outfall	08+094	Two 750 mm (30")	East Side Pump Station Outfall	City of Santa Clara	MAJOR: Extend /new headwall/hardscape
Sanitary Sewer	08+097	1125 mm (45")	Sanitary sewer with 900 mm (36") polyethylene liner built in 1963	City of Santa Clara/City of San Jose	MAJOR: Replace
Sanitary Sewer	08+105	1050 mm (42")	Sanitary sewer with 900 mm (36") polyethylene liner built in 1963	City of Santa Clara/City of San Jose	MAJOR: Replace
Reclaimed Water	08+140 to 09+205	300 mm (12")	PVC along west bank between the levee and ditch from 237 to Tasman	City of Santa Clara	PROTECT IN PLACE

Note 1: Invert elevations and/or dimensions are not available.

Type	Station	Size	Description	Owner	Comment
Gas Pipeline	08+137	--	Gas Pipeline	--	MAJOR: Replace
Pump Station	08+344	--	Oakcrest Estates Pump Station No. 9 - ~ 0.425cms (15cfs)	City of Santa Clara Oakcrest Estates	NOT TO BE DISTURBED
Storm Drain Outfall	08+345	375 mm (15")	Oakcrest Estates Pump Station Outfall	Oakcrest Estates	PROTECT IN PLACE
Pump Station	08+643	--	Oakmead Pump Station No. 11 - 20.81 cms (735 G119cfs)	City of San Jose	NOT TO BE DISTURBED
Storm Drain Outfall	08+648	(Note 1)	Oakmead Pump Station Outfall	City of San Jose	MINOR: Extend/New Headwall/ Hardscape
Storm Drain Outfall	08+988	1050 mm (42")	CMP	City of Santa Clara	MINOR: Extend/ Hardscape
REACH E					
Reclaimed Water	09+205	750 mm (30")	Steel pipe	City of San Jose	PROTECT IN PLACE
Proposed Nitrogen Pipeline	09+200	150 mm (6")	Carbon Steel	Air Products Manufacturing Corp.	PROTECT IN PLACE
Bridge - Tasman Road	9+245				
Electric Line	09+250 (approx.)	--	Line Across Tasman Bridge	City of Santa Clara	PROTECT IN PLACE
Proposed Reclaimed Water	09+300 (approx.)	750 mm (30")	Proposed Reclaimed Water	--	PROTECT IN PLACE
Storm Drain Outfall	09+340	(Note 1)	--	City of Santa Clara	PROTECT IN PLACE
Storm Drain Outfall	09+547	(Note 1)	--	City of Santa Clara	MAJOR: Replace/ New Headwall/ Hardscape

Note 1: Invert elevations and/or dimensions are not available.

Type	Station	Size	Description	Owner	Comment
Storm Drain Outfall	09+768	900 mm (36")	--	City of Santa Clara	MAJOR: Replace/ New Headwall/ Hardscape
Gas Pipeline	10+069	600 mm (24")	API	PG&E	PROTECT IN PLACE
Reach D					
Hetch Hetchy Water Pipeline	10+145	1800 mm (72")	--	S.F. Water District	PROTECT IN PLACE
Hetch Hetchy Water Pipeline	10+148	2250 mm (90")	--	S.F. Water District	PROTECT IN PLACE
Pump Station	10+164	--	Fairway Glen Pump Station No. 8 - 6.99cms(247cfs)	City of Santa Clara	NOT TO BE DISTURBED
Storm Drain Outfall	10+167	750 mm (30")CCP, 1050 mm (42")CCP, 1050 mm (42")CCP, 300 mm (12")DIP, and 1050 mm (42") CCP	Fairway Glen Pump Station Outfall	City of Santa Clara	MAJOR: Extend/New Headwall/ Hardscape
Storm Drain Outfall	10+587	750 mm (30")	RCP	Private or City of Santa Clara	MAJOR: Replace/ Hardscape
Storm Drain Outfall	10+644	250 mm (10")	Force Main Extension	Agnews	MINOR: End at new levee/Conc. Maintenance Rd.
Strom Drain Outfall	10+683	250 mm (10")	CMP with 300 mm (12") steel pressure line	Private or City of Santa Clara	MINOR: End at new levee/Conc. Maintenance Rd.
Storm Drain Outfall	10+756	1350 mm (54")	RCP	Private or City of Santa Clara	MAJOR: Replace
Storm Drain Outfall	10+964	450 mm (18")	CMP	Private or City of Santa Clara	MINOR: End at new levee/ Conc Maintenance Rd.

Note 1: Invert elevations and/or dimensions are not available.

Type	Station	Size	Description	Owner	Comment
Pump Station	10+970	--	River Oaks Pump Station No. 7 - 1.90cms(67cfs)	City of San Jose	NOT TO BE DISTURBED
Storm Drain Outfall	10+964	1000 mm (40")	River Oaks Pump Station Outfall	Private	MAJOR: Replace
Storm Drain Outfall	11+056	450 mm (18")	CMP	City of Santa Clara	MINOR: Replace
Storm Drain Outfall	11+250	450 mm (18")	CMP		MINOR: End at new levee/Conc. Maintenance Rd.
Pump Station	11+761	--	Lick Mill Pump Station No. 5 - 6.62cms(234cfs)	City of San Jose	NOT TO BE DISTURBED
Storm Drain Outfall	11+757	Three 1200 mm (48")	Lick Mill Pump Station Outfall (RCP)	City of Santa Clara	MAJOR: Extend/ New headwall/ Hardscape
Pump Station	11+795	--	RINCON Pump Station No. 6 - 10.19cms(360cfs)	City of San Jose	NOT TO BE DISTURBED
REACH C					
Storm Drain Outfall	11+809	1800 mm (72")	RINCON Pump Station Outfall	City of San Jose	MAJOR: Replace
Bridge - Montague Expressway	11+825				
Electric	11+837 to 12+798	--	Electric overhead high voltage along west bank	City of Santa Clara	PROTECT IN PLACE
Storm Drain Outfall	11+840	1800 mm (72")	RCP	City of Santa Clara	MAJOR: Replace

Note 1: Invert elevations and/or dimensions are not available.

Type	Station	Size	Description	Owner	Comment
Pump Station	12+476	--	Nelo & Victor Pump Station (No. 4 - 60 cfs)	City of Santa Clara	NOT TO BE DISTURBED
Storm Drain Outfall	12+476	1200 mm (48")	Nelo & Victor Pump Station Outfall	City of Santa Clara	MAJOR: Replace
Storm Drain Outfall	12+470	1350 mm (54")	--	City of Santa Clara	PROTECT IN PLACE
Pump Station	13+267	--	Laurelwood & Victor Pump Station No. 3 - 3.71cms(131cfs)	City of Santa Clara	NOT TO BE DISTURBED
Storm Drain Outfall	13+261	1650 mm (66")	Laurelwood & Victor Pump Station Outfall	City of Santa Clara	MAJOR: Replace
Storm Drain Outfall	13+329	1500 mm (60")	RCP	City of Santa Clara	PROTECT IN PLACE
Storm Drain Outfall	13+362	450 mm (18")	CMP	--	PROTECT IN PLACE
Pump Station	13+500	--	Gateway Pump Station No. 2 - 0.20cms(7cfs)	City of San Jose	NOT TO BE DISTURBED
Storm Drain Outfall	13+500	(Note 1)	Gateway Pump Station Outfall	City of San Jose	MAJOR: Proposed pumphouse outfall
Proposed Nitrogen Pipeline	13+553	250 mm (10")	--	Air Products Manufacturing Corp.	PROTECT IN PLACE

Note 1: Invert elevations and/or dimensions are not available.

Type	Station	Size	Description	Owner	Comment
Reach B					
Storm Drain Outfall w/ Pipe	13+679	900 mm (36")	--	City of San Jose	PROTECT IN PLACE
Fiber Optic Lines	13+692	Two 31.25 mm (1-1/4")	HDPE Conduits	MFS NetworkTechnologies, Inc.	PROTECT IN PLACE
Storm Drain Outfall	13+695	(Note 1)	--	--	MINOR: Cleanout filled pipe
Bridge - Trimble	13+700				
Sanitary Sewer	13+933	300 mm (12") CI (siphon)	Attached to Trimble Bridge	City of San Jose	PROTECT IN PLACE
Storm Drain Outfall	13+932	1200 mm (48")	RCP	City of Santa Clara	PROTECT IN PLACE
Storm Drain Outfall	13+950 (approx.)	1350 mm (54")	CMP	City of San Jose	NOT FOUND
Storm Drain Outfall	14+007	1800 mm (72")	RCP	City of Santa Clara	PROTECT IN PLACE
Sanitary Sewer	14+036	375 mm (15") and 600 mm (24")	VCP	City of Santa Clara/ City of San Jose	PROTECT IN PLACE
Storm Drain Outfall	14+038	1950 mm (78")	RCP	City of Santa Clara	PROTECT IN PLACE
Sanitary Sewer	--	300 mm (12")	VCP	City of San Jose	PROTECT IN PLACE
Storm Drain Outfall	--	Two 100 mm (4")	PVC Outfall into Alviso Slough from Catherin and Hope Pump Station	--	PROTECT IN PLACE
Storm Drain Outfall	14+361	300 mm (12")	CMP	--	PROTECT IN PLACE
Storm Drain Outfall	14+372	300 mm (12")	CMP	City of Santa Clara	PROTECT IN PLACE
REACH A					
Bridge - Highway 101	14+525				
Storm Drain Outfall	14+580	Two 750 mm (30")	RCP	City of San Jose	PROTECT IN PLACE
Storm Drain Outfall	14+606	1800 mm (72")	RCP	City of San Jose	PROTECT IN PLACE
Storm Drain Outfall	14+615	1350 mm (54")	RCP	City of San Jose	PROTECT IN PLACE
Storm Drain Outfall	14+622	750 mm (30")	--	City of San Jose	PROTECT IN PLACE

Note 1: Invert elevations and/or dimensions are not available.

Type	Station	Size	Description	Owner	Comment
Bridge - Island Bridge	14+700				
Storm Drain Outfall	14+763	900 mm (36")	CMP	City of San Jose	PROTECT IN PLACE
Storm Drain Outfall	14+815	750 mm (30")	CMP	City of San Jose	PROTECT IN PLACE
Storm Drain Outfall	15+266	750 mm (30")	--	City of San Jose	PROTECT IN PLACE
Storm Drain Outfall	15+311	Two 600 mm (24")	RCP	City of San Jose	PROTECT IN PLACE
Storm Drain Outfall	15+393	750 mm (30")	--	City of San Jose	PROTECT IN PLACE
Storm Drain Outfall	15+414	(Note 1)	--	City of San Jose	PROTECT IN PLACE
Storm Drain Outfall	15+439	600 mm (24")	CMP	City of San Jose	PROTECT IN PLACE
Storm Drain Outfall	15+459	450 mm (18")	CMP	City of San Jose	PROTECT IN PLACE
Storm Drain Outfall	15+584	450 mm (18")	CMP	City of San Jose	PROTECT IN PLACE
Storm Drain Outfall	15+646	1350 mm (54")	CMP	City of San Jose	PROTECT IN PLACE
Storm Drain Outfall	15+675	600 mm (24")	--	City of San Jose	PROTECT IN PLACE
Storm Drain Outfall	15+688	1350 mm (54")	--	City of San Jose	PROTECT IN PLACE
Bridge - Airport Parkway	15+700				
Storm Drain Outfall	15+700	Sanitary Sewer Siphon	--	City of San Jose	PROTECT IN PLACE
Storm Drain Outfall	16+003	900 mm (36")	--	City of San Jose	PROTECT IN PLACE
Bridge - Skyport Drive	16+285				
Storm Drain Outfall	16+530	750 mm (30")	RCP	City of San Jose	PROTECT IN PLACE
Storm Drain Outfall	16+689	1950 mm (78")	RCP	City of San Jose	PROTECT IN PLACE
Storm Drain Outfall	16+702	1950 mm (78")	--	City of San Jose	PROTECT IN PLACE
Storm Drain Outfall	16+850	(Note 1)	--	City of San Jose	PROTECT IN PLACE

Note 1: Invert elevations and/or dimensions are not available.

Type	Station	Size	Description	Owner	Comment
Storm Drain Outfall	17+139	(Note 1)	--	City of San Jose	PROTECT IN PLACE
Storm Drain Outfall	17+321	450 mm (18")	CMP	City of San Jose	PROTECT IN PLACE
Storm Drain Outfall	17+422	900 mm (36")	–	City of San Jose	PROTECT IN PLACE
Storm Drain Outfall	17+444	750 mm (30")	–	City of San Jose	PROTECT IN PLACE
Storm Drain Outfall	17+490	900 mm (36")	–	City of San Jose	PROTECT IN PLACE
Storm Drain Outfall	17+552	1350 mm (54")	RCP	City of San Jose	PROTECT IN PLACE
Bridge - I-880	17+613				

Note 1: Invert elevations and/or dimensions are not available.

CHAPTER 3
PROJECT AREA BACKGROUND

This chapter describes the study area background elements that were evaluated to formulate the LGRP. The description of these technical data include historic and recent flooding problems, potential for flooding (design flood), erosion and sediment problems, land subsidence, sea level rise, susceptibility to seismic events, local drainage problems, and maintenance concerns.

3.1 Geomorphology

A geomorphic study was conducted by NHC as part of their Lower Guadalupe River Sedimentation Study, dated January 2000 (NHC 2000b). This study concluded the following:

- The Guadalupe River basin has undergone tremendous land use changes since the turn of the century, including dam construction in the upper watershed, urbanization of Santa Clara Valley, and river training and levee construction along all major streams.
- The tidal reach of the Lower Guadalupe River (Alviso to Montague Expressway) is a depositional environment, characterized by low slope, low energy conditions with a well-defined low flow channel and aggraded channel banks. Bed and bank material consists primarily of silt and clay.
- The non-tidal reach (Montague Expressway to I-880) exhibits greater channel slope and higher stream energy, as well as both erosional (e.g., I-880 to Airport Parkway) and depositional zones (e.g., Trimble Road to Montague Expressway). Bed and bank material consists largely of sands and gravels.
- Levee construction in 1963 reduced channel length by 25 percent, mainly in the area downstream of Tasman Drive where several historic meanders were present. Levees also eliminated the former distributary flow pattern of the Guadalupe River downstream of Alviso and the ability of high flows to flood adjacent floodplains upstream of Alviso.
- A comparison of river profiles between 1982 and 1996 showed general declines in invert elevation of 0 to 2.5 m, primarily downstream of Trimble Road. This was mainly caused by localized incision of the channel invert rather than general bed degradation.
- Volumetric comparisons made from 1983/1987 and 1996 cross-section data show general erosion to have occurred from I-880 to Trimble Road, whereas deposition occurred from Trimble Road to Alviso. This deposition almost always occurred in the form of aggrading and widening channel banks which encroached the channel. The tendency for the river to adopt this type of cross section should be considered as part of any channel modification plan for this section of river.

3.1.1 Land Subsidence

Santa Clara Valley has experienced regional land subsidence since at least 1906. Much of this subsidence is attributed to large-scale groundwater overdraft that occurred before 1965. Subsidence and groundwater table measurements from 1906 to 1955 reveal this trend (Figure 3-1). Figure 3-1 shows that almost all of the 14 feet of subsidence measured in downtown San Jose occurred from 1906 to 1965. Since 1965, the groundwater table has reversed its downward trend and only about 1 foot of additional subsidence has occurred. This is a result of recharging the subbasins with local and imported water through the use of percolation ponds, which have maintained the supply of groundwater since 1965.

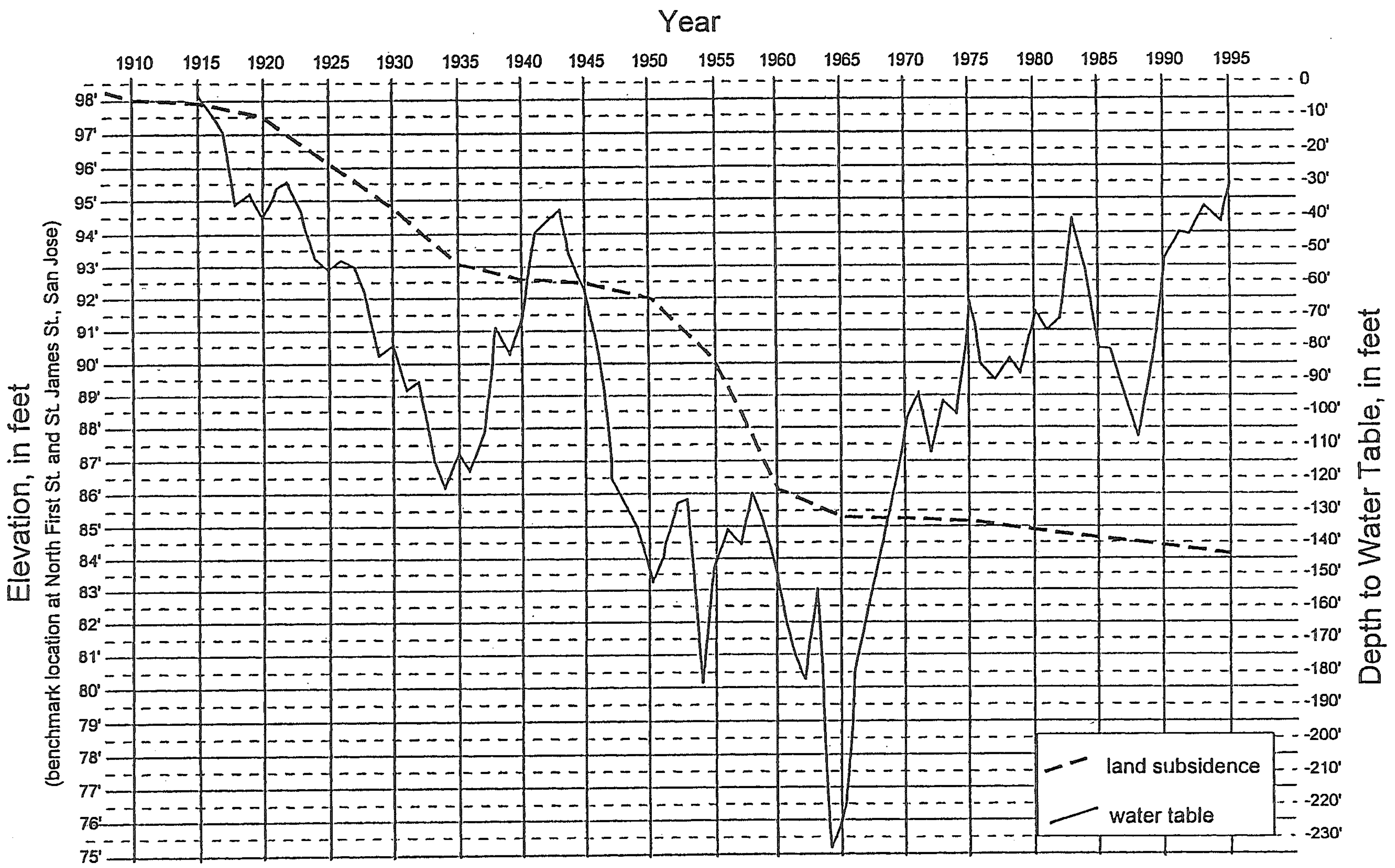
Figure 3-2 shows that land subsidence along the Guadalupe River has not been uniform, at least for the period 1934 to 1967. Subsidence was at a maximum in San Jose at 2.43 m (8 ft) from 1934 to 1967, and lessened with distance outward, approaching 0.91 m (3 ft) at the mouth of the Guadalupe River. Land subsidence at San Jose reached 3.87 m (12.7 ft) in 1973, and has since been largely controlled by groundwater recharge from the District. Subsidence has altered the bed slope of the Guadalupe River throughout the affected area. Subsidence of the downstream-most portions of the study area has also contributed to recent dramatic land encroachment of tidal processes extending to about Montague Expressway.

3.1.2 Susceptibility to Seismic Sources

The San Francisco Bay region is one of the most seismically active areas in North America. Thus, the potential for earthquakes to cause geologically based channel changes is high. Earthquakes can cause significant lateral and/or vertical coseismic adjustment of the ground surface. Liquefaction effects associated with ground shaking may also be produced in fine-grained tidal deposits or areas of loose, unconsolidated fill. This may cause localized settling of channel levees as well as redistribution of in-channel bed and bank sediments along the Guadalupe River.

Regional Faults and Seismic Sources

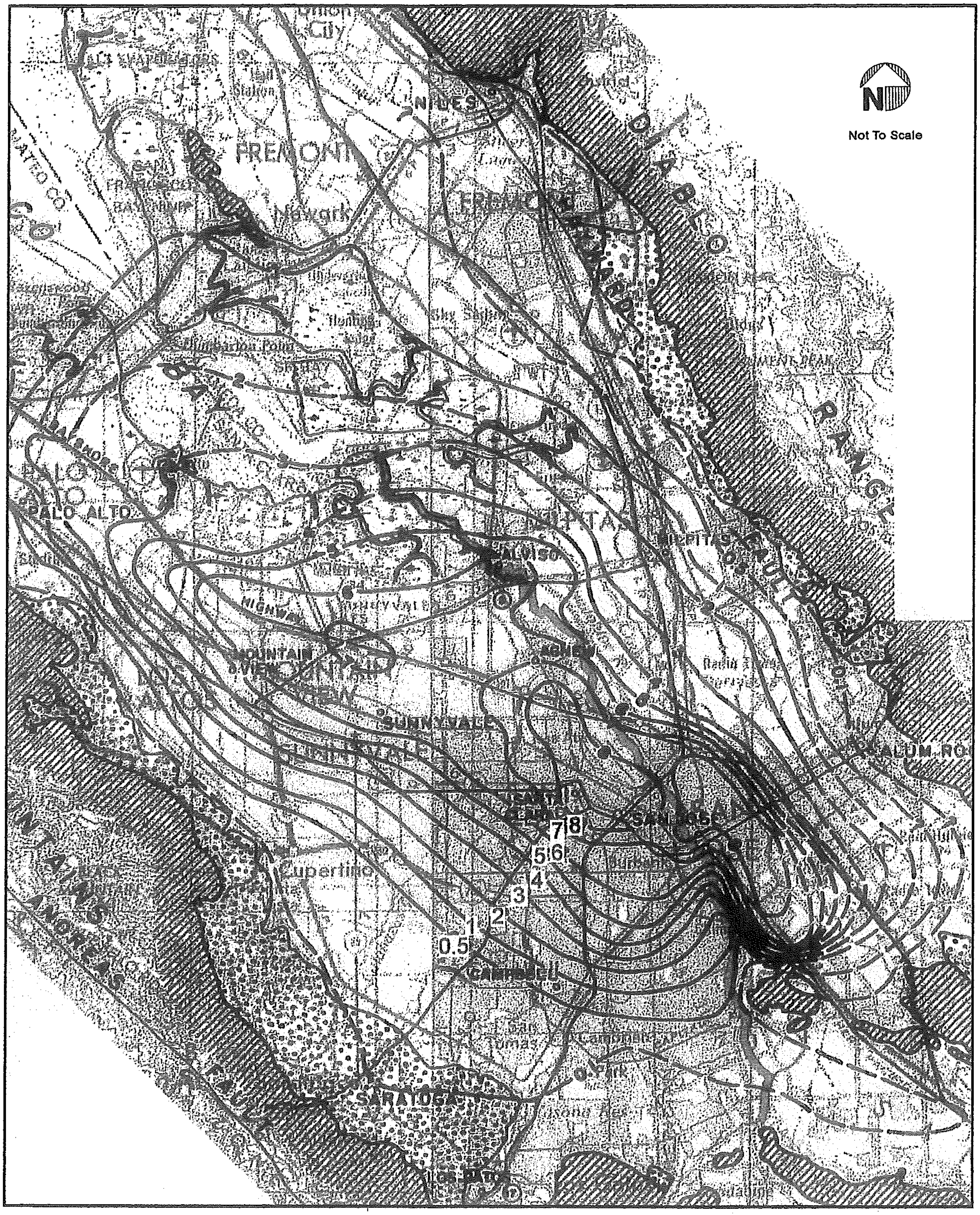
The active faults that could potentially generate earthquakes producing strong ground motions along the LGRP are described below. Each fault is characterized in terms of the type, rupture length, dip, maximum magnitude, and slip rate. The median (50th percentile) peak horizontal accelerations potentially generated by the maximum earthquake for each seismic source were tabulated in the Guadalupe River Report and Mitigation Monitoring Plan (CH2M HILL 2000d). The maximum magnitudes for these faults were adopted from the Working Group on Northern California Earthquake Potential (WGNCEP 1996).



Source: Atwater, B.F., Hedel, C.W., and Heeley, E.J., "Late Quaternary depositional history, Holocene sea-level changes, and vertical crustal movement, southern San Francisco Bay, CA." Geological Survey Professional Paper 1014, 15p.

Northwest Hydraulic Consultants. 2000. Lower Guadalupe River Sedimentation Study. Santa Clara Valley Water District.

Figure 3-1
Land Subsidence and Depth to Water Table in San Jose (1906-1995)
Lower Guadalupe River Project



Map showing equal lines of land subsidence (in feet) in Santa Clara Valley from 1934 to 1967 (from Poland and Ireland, 1968) overlaid onto topographic mapping from the USGS.

Guadalupe River is highlighted in blue.

Figure 3-2

Map Showing Equal Lines of Land Subsidence in Santa Clara Valley (1934-1967)

Lower Guadalupe River Project

Source: NHC, 2000.

San Andreas Fault

The San Andreas fault extends from the Gulf of California, Mexico, to Point Delgada on the Mendocino Coast in northern California, a total distance of 1,200 km (746 miles). The San Andreas accommodates the majority of the motion between the Pacific and North American plates. This is the largest active fault in California and is responsible for the largest known earthquake in northern California, the 1906 moment magnitude (M_W) 8 San Francisco earthquake (Wallace 1990). Movement on the San Andreas fault is right-lateral strike-slip, with a total offset of some 560 km (348 miles; Irwin 1990). In northern California, the San Andreas fault is clearly delineated, striking northwest, approximately parallel to the vector of plate motion between the Pacific and North American plates. Over most of its length, the San Andreas is a relatively simple, linear fault trace. However, immediately south of San Francisco Bay, the fault splits into a number of fault splays, including the Calaveras and Hayward faults. In the San Francisco Bay area the main trace of the San Andreas fault forms a linear depression along the peninsula occupied by the Crystal Springs Reservoirs.

Geomorphic evidence for Holocene faulting includes fault scarps in Holocene deposits, right-laterally offset streams, shutter ridges, and closed linear depressions (Wallace 1990). The 1906 earthquake resulted from rupture of the fault from San Juan Bautista north to Point Delgada, a distance of approximately 470 km (293 miles). The average amount of slip on the fault during this earthquake was 5.1 m (16.7 ft) in the area to the north of the Golden Gate, and 2.5 m (8.2 ft) in the Santa Cruz mountains (WGNCEP 1996).

Based on differences in geomorphic expression, fault geometry, paleoseismic chronology, slip rate, seismicity, and historic fault ruptures, the San Andreas fault is divided into a number of fault segments. In the San Francisco Bay area, these segments include the Santa Cruz mountains, a possible source of the 1989 M_W 7.1 Loma Prieta earthquake and the Peninsula segment. The slip rate on these segments is 14 and 17 mm/year (0.55 and 0.67 in/year), respectively. Both of these segments, along with the North Coast segment, ruptured during the 1906 M_W 8 San Francisco earthquake. The Santa Cruz mountains, Peninsula, and 1906 rupture segments have calculated maximum credible earthquakes (MCEs) of M_w 7, 7, and 8, respectively (WGNCEP 1996).

Hayward Fault

The Hayward fault extends for 100 km (62 miles) from the area of Mount Misery, east of San Jose, to Point Pinole on San Pablo Bay. Systematic right-lateral geomorphic offsets and creep offset of cultural features have been well documented along the entire length of the fault (Lienkaemper et al. 1991). The Hayward fault is considered to be the most likely source of the next major earthquake in the San Francisco Bay area (WGCEP 1990). The last major earthquake on the Hayward fault, in October 1868, occurred along the southern segment of the fault. This Richter local magnitude (M_L) 7 event caused toppling of buildings in Hayward and other localities within about 5 km (3.1 miles) of the fault. The surface rupture associated with this earthquake is thought to have extended for approximately 30 km (18.6 miles), from Warm

Springs to San Leandro, with a maximum reported displacement of 1 m (3.28 ft). As well as moving during earthquake ruptures, the Hayward fault also moves by a seismic creep. Measurements along the fault over the last two decades show that the creep rate is 5 to 9 mm/year (0.20 to 0.35 in/yr; Lienkaemper et al. 1991). The WGNCEP (1996) assigns MCEs of M_W 6.9 and recurrence intervals of 210 years for both the northern and southern segments of the Hayward fault. Recent research of historical documents has led to the conclusion that an earthquake in 1836, previously thought to have occurred on the northern Hayward fault occurred elsewhere, thereby increasing the time since the last earthquake on this segment of the fault. Recent paleoseismic trenching along the northern Hayward fault indicates that the last surface rupturing earthquake along this part of the fault was sometime between 1626 and 1724 (Lienkaemper et al. 1997). This study also indicated that there were at least four surface rupturing earthquakes in the last 2,250 years.

Hayward Fault Southwest Extension

The Hayward fault zone extends to the south of Milpitas, along the eastern margin of the Santa Clara Valley, as a broad zone of reverse and reverse-oblique faulting. This zone of faulting includes the Quimby, Crosley, and Evergreen faults, as well as the southeastern extension of the Hayward fault. The predominant sense of motion on these faults is right-lateral strike-slip on the continuation of the Hayward fault itself, becoming reverse-oblique, with an increasing thrust faulting component towards the west. The thrust faults dip to the northeast. Trenching investigations and the geomorphic expression of these faults indicate that they have been active during late Pleistocene, and possibly even Holocene time. The WGNCEP (1996) assigns a MCE of M_W 6.5 to the southeastern extension of the Hayward fault.

Calaveras Fault

The Calaveras fault is a main component of the San Andreas system, branching off the main San Andreas fault south of Hollister, and extending northwards for approximately 120 km (75 miles) to die out in the area of Danville. The predominant sense of motion on the Calaveras fault is right lateral strike-slip. A smaller component of vertical displacement is evident in some areas along the fault trace. The Calaveras can be divided into two distinct sections, northern and southern, with the boundary located at Calaveras Reservoir.

The Calaveras fault has generated a number of moderate-size earthquakes in historic time, including the following:

- 1861 M_W 5.9 event
- 1886 M_W 5.4 event
- 1897 M_W 6.2 event
- Probable M_W 6.5 event in 1911
- 1988 M_W 5.1 Alum Rock event
- 1979 M_W 5.9 Coyote Lake event
- 1984 M_L 6.2 Morgan Hill event

To the south of Calaveras Reservoir, microseismicity clearly delineates the active trace of the fault. The long-term slip rate and contemporary creep rate for the southern Calaveras fault are approximately 15 mm/yr (0.59 in/yr; WGNCEP 1996). The WGNCEP (1996) calculated a MCE of M_W 6.5 for the (southern and northern) Calaveras fault.

Monte Vista – Shannon Fault

The Monte Vista-Shannon fault zone is one of a series of southwest-dipping thrust and reverse-oblique faults along the southwestern margin of the Santa Clara Valley. Collectively known as the Foothills Thrust System, this is a series of range-front faults that mark the boundary between the southern Santa Cruz mountains and the western Santa Clara Valley. The Monte Vista fault extends from Palo Alto, southeast, through Los Altos, Los Altos Hills, and Cupertino to Saratoga. Rather than a single fault, this is a belt of southwest-dipping thrust faults. Limited trench data, stream channel profiles, and stream terrace elevations all indicate late Pleistocene and possibly Holocene movement on the Monte Vista thrust (Hitchcock et al. 1994). To the south of Saratoga, the continuation of the Monte Vista fault is mapped as the Shannon fault. The Shannon fault also comprises a series of southwest-dipping thrust faults that offset Miocene bedrock and cut a paleosol reported to be less than 20,000 years old (R. McLaughlin, USGS, reported in Hitchcock et al. [1994]). The Monte Vista-Shannon fault is capable of generating a MCE of M_W 6.75 (WGNCEP 1996).

Sargent – Berrocal Fault

The Sargent-Berrocal fault is a 94-km-long (58.4 miles), complexly branching system of southwest-dipping thrust and reverse oblique faults associated with the San Andreas fault. Evidence of recent movement along the Sargent fault include reports of surface rupture along the fault trace in the vicinity of Page Mill Road in Palo Alto during the 1906 earthquake and some possible aftershocks of the 1989 Loma Prieta earthquake. The northern two-thirds of the fault converges with the San Andreas fault at depth, and may not be an independent seismic source (WGNCEP 1996). The Sargent-Berrocal fault is considered capable of generating a MCE of M_W 6.75.

Ground Motions

To characterize the attenuation of ground motions from the seismic sources described above to the LGRP, empirical attenuation relationships appropriate for deep soil were used. These include Abrahamson and Silva (1997), Boore et al. (1993), Campbell (1997), and Sadigh et al. (1997). Median (50th percentile) peak horizontal ground accelerations (PGAs) were calculated for various reaches of the LGRP. The PGAs were calculated using the MCE for each seismic source described above, and the closest approach of each of these sources to each reach of the LGRP. For each site, the controlling seismic source is a M_W 8 earthquake along the 1906 segment of the San Andreas fault. This event generates median peak horizontal ground accelerations of 0.31 to 0.33 (g).

3.2 Soils and Tidal Hydrology

In general, the east and west levees of the Lower Guadalupe River are of earthfill construction, are trapezoidal shaped in cross section and range in height from about 2.5 to 4.5 m (8 to 15 ft). The crest serves as an access road and is covered with armoring aggregate (gravel). In 1995, both levees between the UPRR Bridge and Highway 101 were raised, including some areas with soil reinforcement or concrete floodwalls; in many cases the top slopes were steepened. The levee crest road was surfaced with armoring aggregate; the crest width is about 4 to 5.75 m (13 to 14 ft). Typically, both the inboard and outboard slopes are vegetated with grass, weeds, and scattered shrubs. Animal burrows are common along the entire alignment, but are randomly located on the face of both side slopes. Access for vehicles is provided by the roadway on the crest and supplemented with ramps cut into the inboard slopes of both levees; at some locations an access road is also positioned just beyond the toe of the inboard slope. The low flow channel in some areas approximates the channel centerline and in some areas meanders in close proximity to the inboard toe of the levee. Between the inboard toes of the levees (i.e., in the channel area), the vegetation typically consists of weeds, grass, and occasional trees.

The project is set on Quaternary alluvium composed of gravel, sand, and clay. Based on the Level II Hazardous Materials Investigation completed for the Guadalupe River between UPRR and I-880 (refer to EIR), shallow sediments are primarily composed of a thick sequence of silty and sandy clays, extending to a depth of approximately 18.3 m (60 ft) below grade. Discontinuous lenses (0.3 to 1.2 m [1 to 4 ft] thick) of coarser material are present at approximately the same elevation as the Guadalupe River streambed.

The Lower Guadalupe River flows through an area whose surface contains three different soil types along the alignment (Kleinfelder 2000). These soils include the following:

- Tidal marshland soils, which occur from Station 7+00 to 7+530 (Reach G)
- Sunnyvale/Castro/Clear Lake Association soils, which occur from Station 7+530 to 14+010 (Reaches F to B)
- Clear Lake/Campbell Association soils, which occur from Station 14+010 to 14+550 (Reach B)

Significant portions of the LGRP area are influenced by tidal processes, including wind generated waves, vertical fluctuations in water surface, and the net accumulation of Bay muds. Channel reaches downstream from Montague Expressway and Tasman Drive begin to experience the landward extension of tidal influences caused by the occurrence of mixed diurnal, asymmetric tides that occur in the South Bay. Twice each day, two high and two low tides occur in the Bay. These tides generate landward flow of Bay water during rising tides (referred to as Flood Tide), and a Bayward excursion of flow during the falling tide (referred to as Ebb Tide). Therefore, the water surface elevation in the Lower Guadalupe River can be influenced by the magnitude and timing of high and low tides. This can affect flood stages in the lower-most regions of the river, if the timing of a high tide occurs simultaneously with the peak river discharge during a runoff event.

Fine sediment materials suspended daily in the South Bay by wave action work their way back upstream into the Lower Guadalupe River with each flood tide, resulting in a net long-term accumulation of Bay muds in the bottom of the leveed channels. The rate and extent of this accumulation varies temporally and spatially within the system, but is observed to be significant in the South Bay. It is, therefore, important to estimate the future magnitude and landward extent of the tidal accretion processes to properly evaluate flood protection alternatives.

3.2.1 Erosion and Sediment Problems

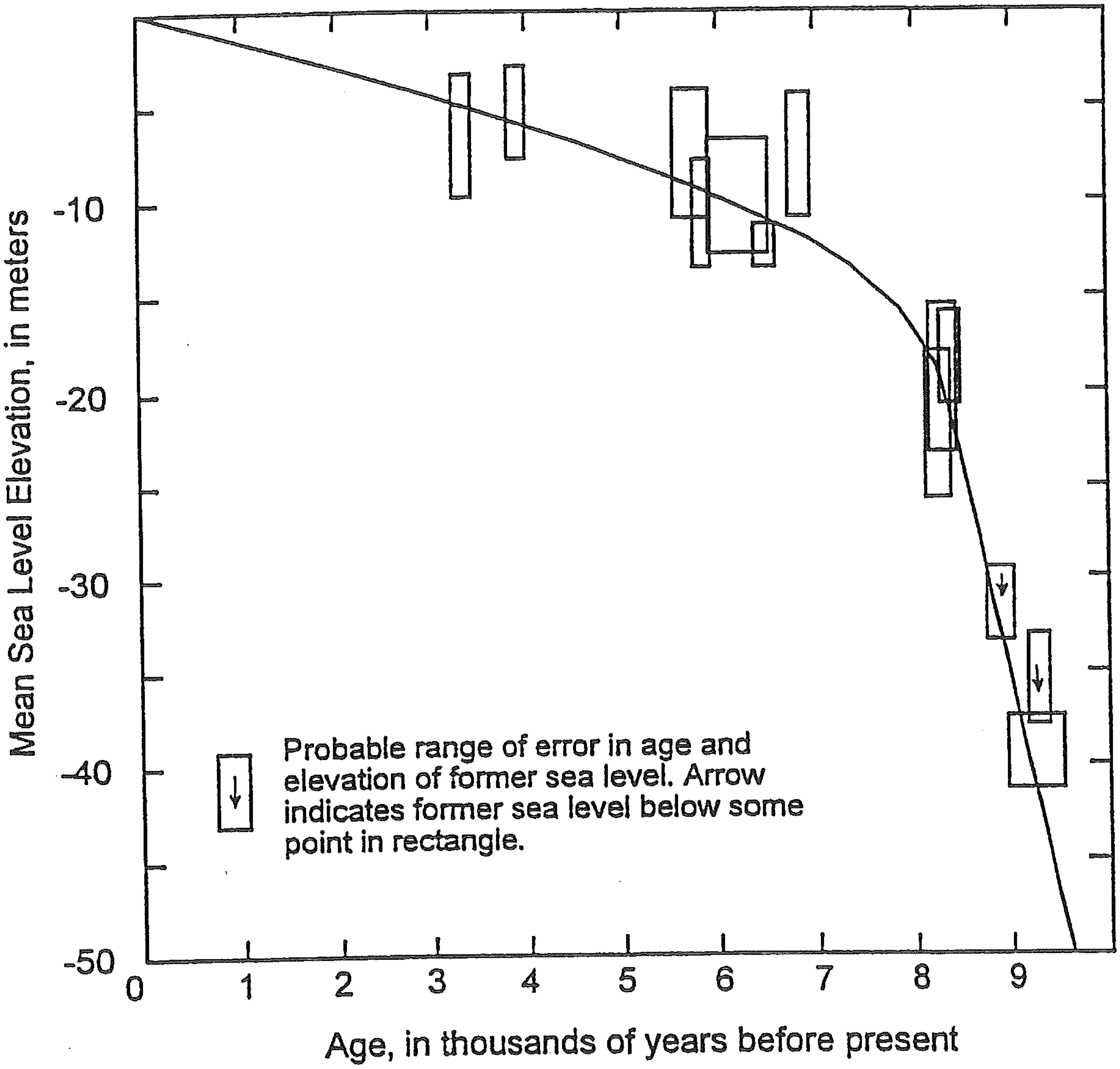
Channel hydraulics and sediment transport characteristics throughout the LGRP area are influenced by natural and man-induced agents and physical processes, including geology, seismicity, tidal processes, subsidence, rising sea levels, changes in land use, urbanization, and channel improvement projects.

The most significant sedimentation problems in the Guadalupe River Watershed occur between Route 237 and Montague Expressway. The problems in this area are mainly caused by the tidal currents that carry suspended silts from the San Francisco Bay and deposit them in the channel. Over time, benches are formed and vegetation established.

The majority of the watershed derived bed material load is comprised of sand-sized materials. These materials accumulate predominantly between Highway 101 and Tasman Drive. The majority of the coarse gravels are deposited in the vicinity of Airport Parkway to Trimble Road. Erosion at the channel bed and toe have been observed in the area immediately downstream of the I-880 Bridge transition structure.

3.2.2 Sea Level Rise

Throughout the Holocene (last 10,000 years), the Guadalupe River has adjusted to consistently rising sea levels (Figure 3-3). Figure 3-3 shows that mean sea level has risen more than 40 m during this period. Much of this rise occurred prior to about 7,000 years before present (B.P.), coinciding with glacial retreat of the last ice age (Atwater et al. 1977). From about 6,000 years B.P. to present, the trend line in Figure 3-3 shows a steady, gradual rise in sea level of 0.1 to 0.2 centimeters (cm) per year, indicating that it may continue to rise into the future. This suggests that sea level might be about 10 to 20 cm (0.4 to 0.8 ft) higher in 100 years, at the end of the design life of the LGRP. Any increases in sea level will result in more extensive landward encroachment of tidal processes (water surface elevation, Bay mud deposits and salinity) in the downstream end of the project area.



Sea level has risen approximately 50 meters through the Holocene (last 10,000 years), lessening to a rate between 0.1 and 0.2 cm/year during the last 6,000 years.

Source: Atwater, B.F., Hedel, C.W., and Heeley, E.J., "Late Quaternary depositional history, Holocene sea-level changes, and vertical crustal movement, southern San Francisco Bay, CA." Geological Survey Professional Paper 1014, 15p.

Northwest Hydraulic Consultants. 2000. Lower Guadalupe River Sedimentation Study. Santa Clara Valley Water District.

Figure 3-3

Holocene Sea Level Changes in South San Francisco

Lower Guadalupe River Project

3.3 Flooding Problems

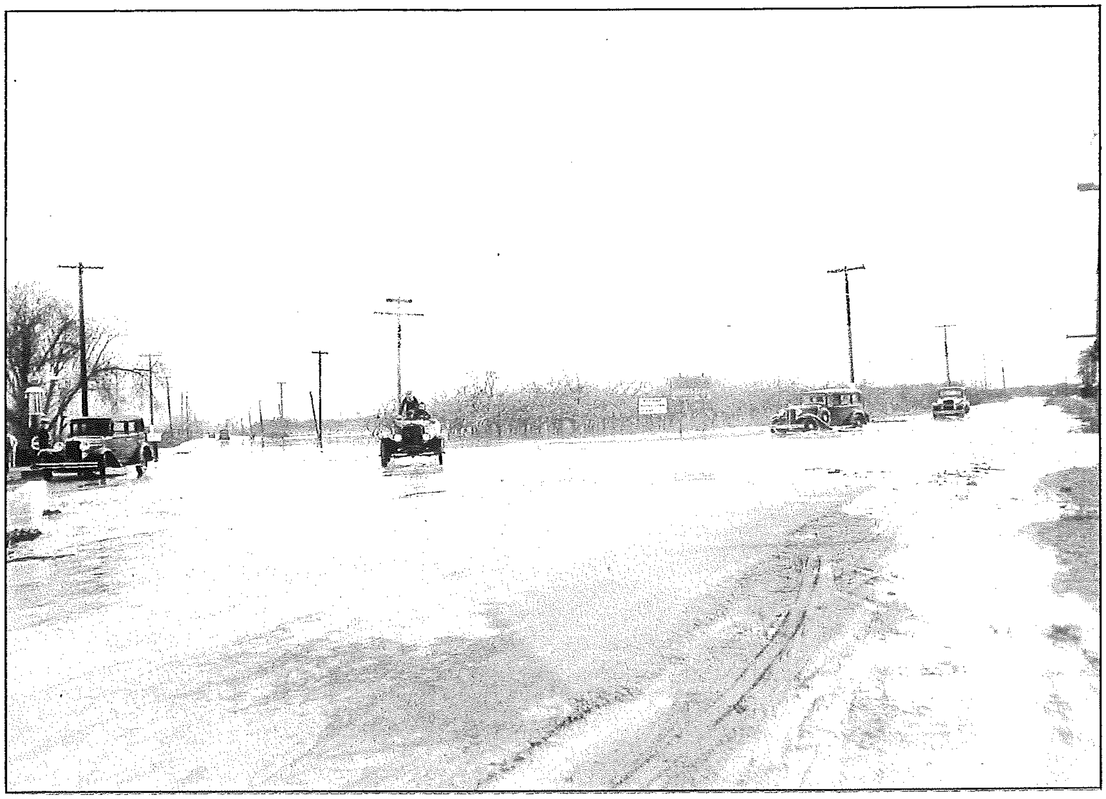
3.3.1 Historic Flooding Problems

Historically, the Guadalupe River has frequently flooded. Flooding was recorded as early as 1889, and major flooding occurred in 1911, 1941, 1945, 1952, 1955, 1958, 1963, and 1967. The damage from flooding was most extensive in 1958, when the instantaneous peak flows reached 259.1 cms (9,150 cfs). In 1963, voters passed a $12.75-million bond for flood protection in the Central Flood Control Zone, which encompasses downtown San Jose (SCVWD 1999b). Improvements to the Lower Guadalupe River funded by the bond consisted of channel modifications, bank and channel bottom stabilization, and levee construction. Figures 3-4, 3-5, and 3-6 are historic flooding photographs of the project area from 1931 through 1963.

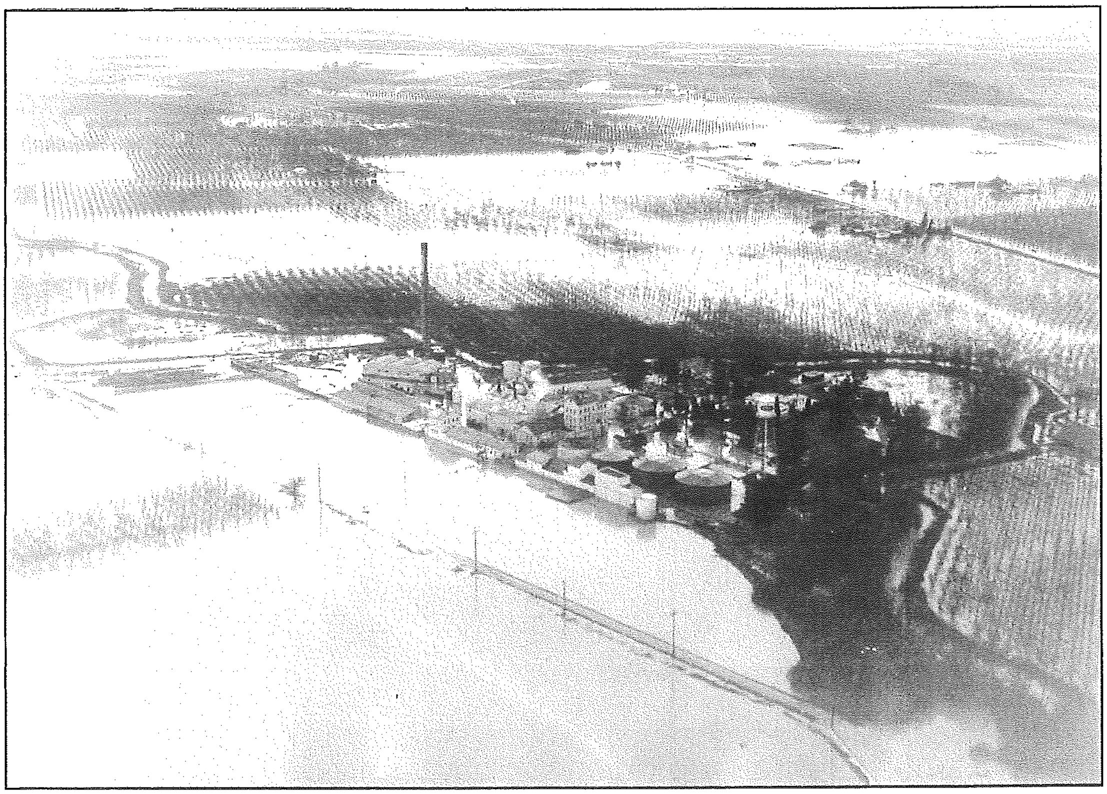
Presently, flood protection is provided through the project area using continuous, parallel earthen levees to contain the flows. The levees were originally built in 1963, but sections were raised in the 1980s and 1990s and a short floodwall was constructed. No other major flood protection features are present in the project area. Studies have revealed that the existing flood control levees are too low to safely convey the design discharge with freeboard.

The lack of channel capacity has been potentially affected by the following key physical features and processes that affect flood conveyance:

- Local geology
- Regional seismology
- Tidal processes
- Subsidence
- Rising sea level
- Changes in land use in the watershed and on the floodplains
- Urbanization
- Channel improvement projects upstream from I-880
- Sediment accumulation from tidal and river processes
- Bridge constrictions
- Aggressive encroachment of in-channel vegetation

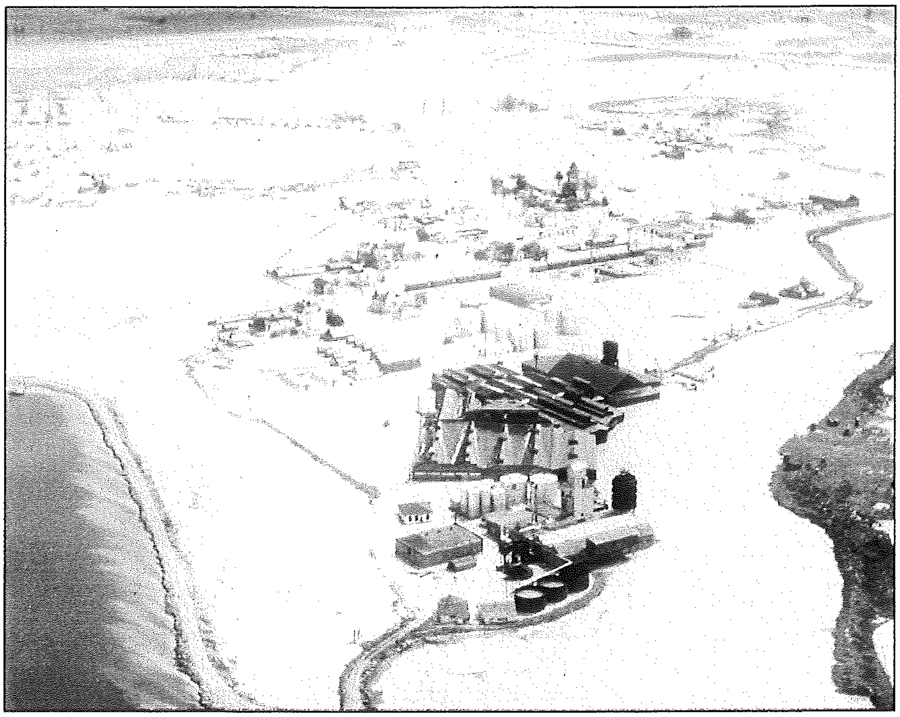


December 1931. Flood conditions at corner of San Jose-Alviso and Milpitas-Alviso Roads.

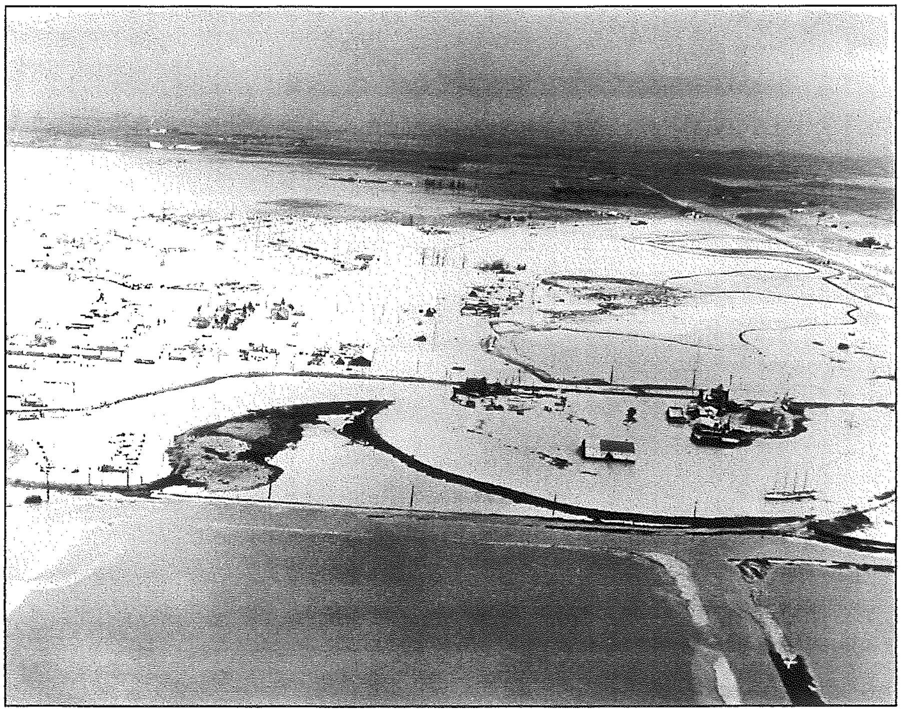


December 1955. Bracher property is on Montague Road to the south of the state hospital. Alviso Road is in the background.

Figure 3-4
Historic Photos, 1931 and 1955
Lower Guadalupe River Project



April 1958. A general view looking southeasterly of Alviso. Cannery, tank farm, etc., are in the foreground. Guadalupe River is to the right and across the top.

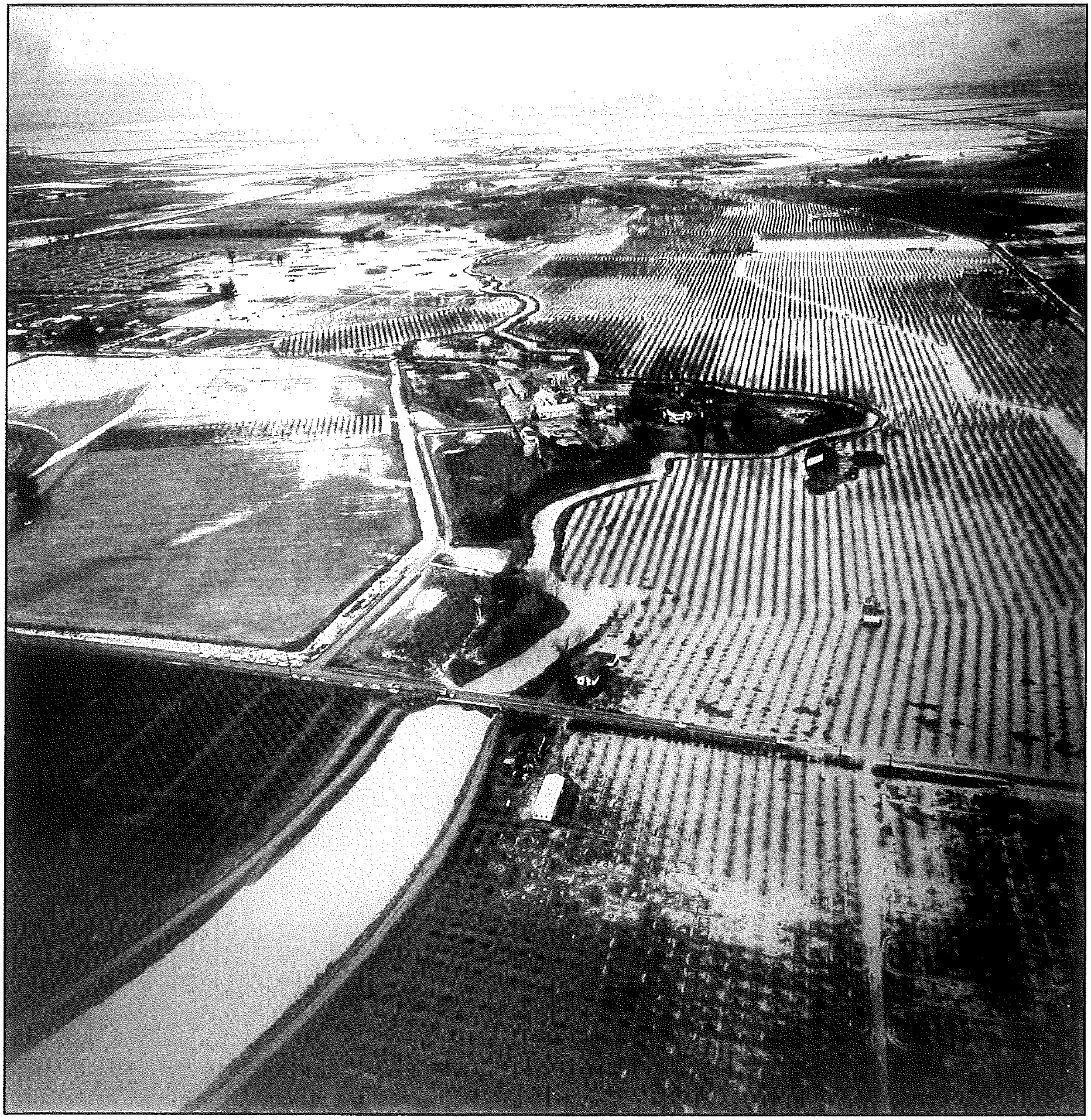


April 1958. Looking easterly across the City of Alviso. Leslie Salt Ponds in the foreground with the long curve of the Guadalupe River in the center. Alviso was completely evacuated - one of the worst floods ever.

Figure 3-5

Historic Photos, 1958

Lower Guadalupe River Project



February 1963. Flood conditions of Guadalupe River at Montague Road. Extensive agricultural flooding occurred.

Figure 3-6

Historic Photo, 1963

Lower Guadalupe River Project

3.3.2 Recent Flooding Problems (1967 to Present)

Since completion of the Corps Hydrologic Study (Corps 1977), floods with peak flood flows that exceeded 169.90 cms (6,000 cfs) at the USGS Guadalupe River at San Jose gauge near St. John Street Bridge have occurred in 1978, 1980, 1982, 1983, 1986, 1995, and 1997. There were two floods in 1982 and two in 1995. The 1986 flood peak value of 9,140 cfs nearly equaled the historic maximum reached in 1958. During the most recent floods in January and March of 1995, there was significant flooding in the immediate vicinity of the Guadalupe River Project area. In January and March 1995, the Guadalupe River overtopped its banks in the neighborhoods between I-280 and Willow Glen Way. Because the river overflowed its banks upstream from the San Jose gauge, measured data of the maximum flows do not exist. However, high watermark data indicates the floodflows likely exceeded 311 cms (11,000 cfs) on March 10, 1995.

The project area has not recently experienced out-of-channel flooding problems. Out-of-channel flooding has been reduced with levee construction in the 1960s, and subsequent levee raising in the 1980s and 1990s. In general, flood flows have broken out of the river channel upstream of LGRP. Since 1940, there have been 10 noteworthy floods (see Table 3-1), the largest occurring on March 10, 1995 (SCVWD 1997). The USGS estimated the instantaneous peak discharge of the March 1995 flood to be 311.4 cms (11,000 cfs) at the Guadalupe River gauging station downstream from Los Gatos Creek. This corresponds to a recurrence interval of about 30 years according to flood frequency estimates published by the Corps (Corps 1977).

Table 3-1
Notable Peak Flows in Guadalupe River During Past 60 Years

Date	Discharge United States Geological Survey Gate Downstream from Los Gatos Creek cms (cfs)	Estimated Frequency* (yrs)
February 27, 1940	246 (8,680)	18
February 2, 1945	187 (6,600)	10
January 12, 1952	227 (8,000)	14
April 2, 1958	259 (9,150)	20
February 19, 1980	224 (7,910)	13
March 31, 1982	208 (7,340)	12
January 24, 1983	202 (7,130)	12
February 18, 1986	259 (9,140)	20
January 9, 1995	263 (9,290)	19
March 10, 1995	311 (11,000)	29

* Based upon Corps' published hydrology.

3.3.3 Local Drainage Conditions

Local drainage is defined as the system of public and private streets, gutters, storm drain inlets, storm sewers, and outfall structures that convey local surface runoff into the Lower Guadalupe River. The local drainage facilities are owned, operated, and maintained by the cities, agencies, or property owners whose lands they drain.

This project is different from the Upper Guadalupe and Downtown Guadalupe River projects because most of the river is confined by levees on both sides of the channel. The elevations of the surrounding property and storm drain systems are below the flood-stage water surface elevation in the river. Local drainage water that would ordinarily enter the river during a storm is prevented from doing so because of the higher elevation of the river water surface. Flap gates or backflow prevention devices are typically installed on the discharge points of each individual storm drain to prevent river water from flowing back into the system. The effect of these backflow devices on each system is to cause ponding of water until the river water surface elevation recedes to the point that the stormwater can flow from the system to the river. Currently, most storm water entering the river within the project area is pumped to avoid these problems.

The City of Santa Clara operates five pump stations located adjacent to the west bank of the river. These include the Laurelwood & Victor, the Nelo & Victor, Lick Mill, Fairway Glen, and East Side pump stations. Interviews with public works staff indicates that problems associated with the storm drain system tributary to the Lower Guadalupe River will likely be limited only to system clogging or runoff from storms that exceed the 10-year design capacity for their system. The newly completed stations have not been thoroughly tested under design conditions but it is anticipated they will function as designed.

The City of San Jose operates 10 pump stations. Six pump stations are located on the east side of the river. They include the Elizabeth and Gold Street (Alviso), Oakcrest, Oakmead, River Oaks, Rincon I and Gateway stations. The four located on the west side of the river include the New Chicago Marsh (Alviso), Liberty (Alviso), Summerset (Alviso) and the Airport facility. A future pump station is proposed for the east side, downstream from Trimble Road. Figure 2-10 illustrates the existing and proposed pump station locations.

The City of San Jose is aggressively addressing their local flooding problems. A master plan entitled, "North San Jose Rincon de los Esteros Storm Drain Master Plan" covers a majority of the local drainage area tributary to the Lower Guadalupe River. The Plan was completed in June 1999. In addition, the Rincon I pump station was put on line in December 1998. This pump station represents the first in a series of upgrades to the storm drain system to provide additional capacity in the drainage system and pumping capacity for a 10-year storm. It also was the last major free outfall converted to a pump station within the project area. The Rincon I pump station itself cannot convey the 10-year storm. The pump station was designed to pass the amount of flow that the existing system can collect. Later phases (number V) include a new 600-cfs pump station (downstream from Trimble Road, east side of river) and conveyance facilities to complete the system and provide the required 10-year storm capacity conveyance in the Rincon de los Esteros area.

The Alviso area, once an independent city, was consolidated with the City of San Jose in 1968. The City of San Jose commissioned the Alviso Master Plan in June of 1993, and the plan was adopted after extensive public participation in December 1998, by the City Council. Some issues from that document will be emphasized herein that specifically address the local (to Alviso) flooding problems.

Alviso experiences similar general local drainage problems as previously described. These problems are exacerbated because of the ground subsidence in Alviso (up to 1.83 m [6 ft]), resulting in the elevation of some property being at or below sea level. In addition, much of Alviso has an incomplete and inadequate (3-year capacity versus current city requirement of 10-year) storm drain system. According to the Alviso Master Plan, "Some locations within the historic western grid do not have underground lines and are subject to localized drainage problems."

3.4 Potential For Flooding (Design Flood Flow)

The design flood flow has the potential to exceed both existing channel and bridge capacities. Channel capacity refers to the present level of protection of the existing levee system without freeboard. Bridge capacity refers to the ability of the existing bridge structures to convey the design flood flow before pressure flow or overtopping occur.

3.4.1 Channel Capacity

The calibrated baseline HEC-RAS™ model (Appendix B) was used to estimate the present capacity of the Lower Guadalupe River channel, from UPRR to I-880. A series of six profiles were simulated with the hydraulic model, ranging from 226 to 651 cms (8,000 to 23,000 cfs) in increments of 85 cms (3,000 cfs). The profile results are plotted in Figure 3-7. A "glass wall" scenario is assumed; the actual water surface elevations in a flood event would probably not reach the heights depicted in the profile, but would instead overtop the levees and flood adjacent areas. The channel capacities illustrated in Figure 3-7 and Table 3-2 do not account for freeboard, but rather they estimate the maximum channel capacity provided by the present levees prior to overtopping. If the 1.07 m (3.5 ft) freeboard is added, the actual capacities would be less.

Existing Channel Capacity Per Reach

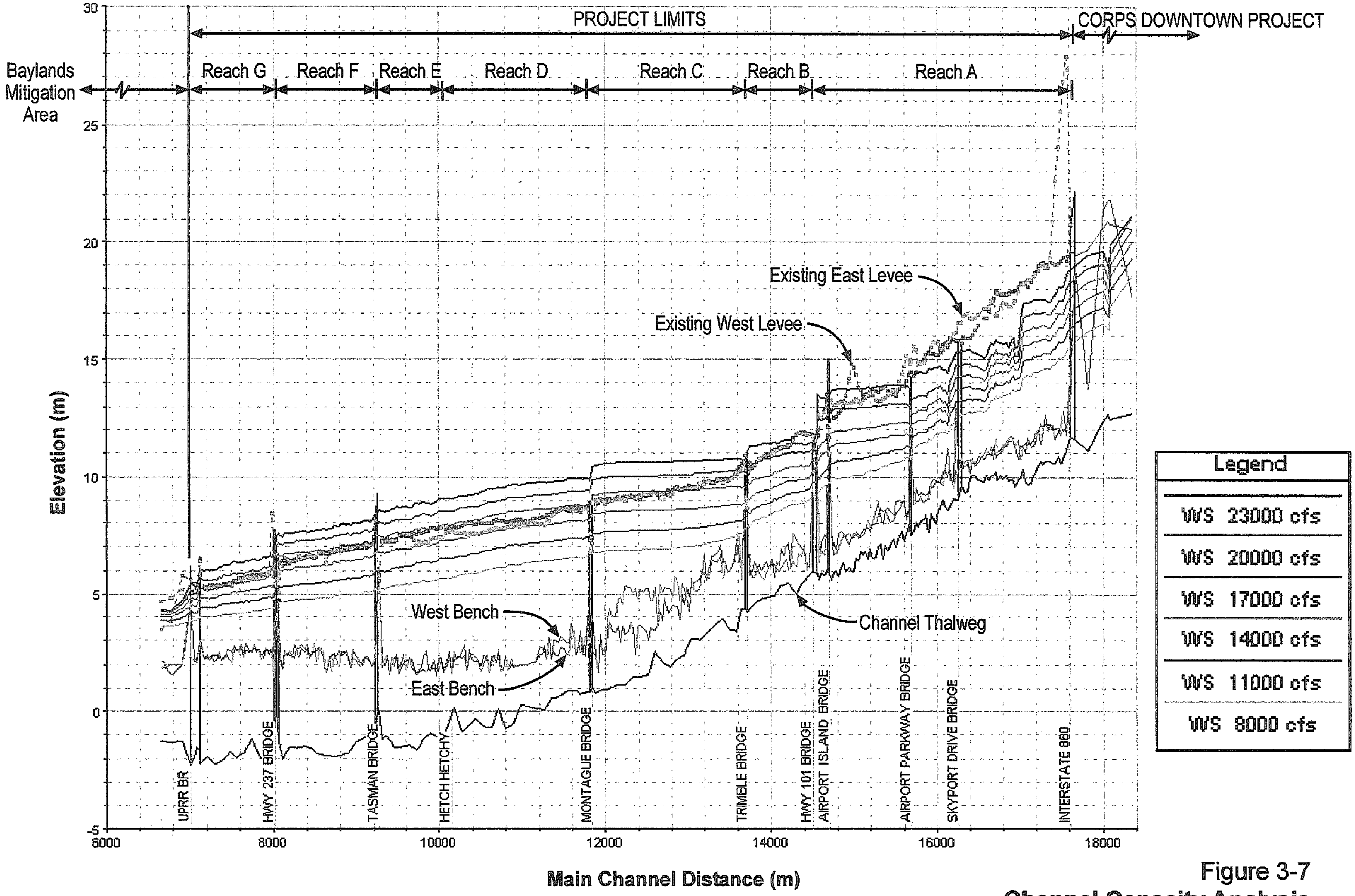


Figure 3-7
Channel Capacity Analysis
Lower Guadalupe River Project

Table 3-2

Approximate Lower Guadalupe River Channel Capacity by Reach*
(Between Levees with No Remaining Freeboard)

Reach	Discharge cms (cfs)
G: UPRR (Station 7005) to Route 237 (Station 8010)	481 (17,000)
D, E, F: Route 237 (Station 8010) to Montague Expressway (Station 11825)	396 (14,000)
C: Montague Expressway (Station 11825) to Trimble (Station 13700)	424 to 566 (15,000 to 20,000)
B: Trimble Road (Station 13700) to Highway 101 (Station 14525)	566 to 651 (20,000 to 23,000)
A: Highway 101 (Station 14525) to Airport Parkway (Station 15685)	524 to 651 (18,500 to 23,000)
A: Airport Parkway (Station 15685) to I-880 (Station 17630)	Over 651 (Over 23,000)

* Values represent approximate ultimate capacities within the present levee system for sub-reaches of the project, assuming no remaining freeboard.

As summarized in Table 3-2, from UPRR upstream to Route 237, the channel capacity is about 481 cms (17,000 cfs). However, above Route 237 and upstream to Montague Expressway, the overall channel capacity drops to approximately 396 cms (14,000 cfs), although some sections of this reach are capable of conveying up to 438 cms (15,500 cfs). Channel capacity gradually increases from Montague Expressway upstream to Highway 101. The capacity is approximately 424 cms (15,000 cfs) just above Montague Expressway, 566 cms (20,000 cfs) at Trimble Road, and over 651 cms (23,000 cfs) below Highway 101. Just above Highway 101 the channel capacity drops to approximately 523 cms (18,500 cfs), and then increases with distance upstream to approximately 651 cms (23,000 cfs) at Airport Parkway. The capacity exceeds 651 cms (23,000 cfs) in the remainder of Reach A, upstream from Airport Parkway.

3.4.2 Bridge Capacity

The calibrated baseline HEC-RAS™ model was also used to estimate the capacity of the existing bridges in the project reach. Top of roadway and soffit elevations of each bridge, based on record drawings and field surveys, were compared to computed water levels from a range of events to determine at what discharge rate each bridge converts from free-surface to pressure flow.

Table 3-3 summarizes the results of the bridge capacity analysis. The stated capacities could change, if debris conditions differ from those assumed. Hydraulic analyses included debris amounts equal to 2 m per pier for Route 237 eastbound bridge and UPRR, 0.5 m per pier for Tasman, and 1 m for all other bridges. These debris width assumptions are consistent with the most recent Lower Guadalupe River HEC-2™ model with the exception of the Tasman and Route 237 eastbound bridges. The debris widths were reduced at these bridges during calibration of the model.

Table 3-3 also indicates which bridges exhibit pressure flow conditions during the design event. The upstream (eastbound) Route 237 Bridge is a significant constriction, capable of passing only 65 percent of the design event discharge without going to pressure flow. The Montague Expressway Bridge also has a limited capacity. These two bridges are also the only ones that are shown to overtop during the simulated design flood event.

Table 3-3
Approximate Existing Bridge Capacities

Bridge	Discharge Capacity cms (cfs)	Bridge Deck Overtop During Design Event?	Pressure Flow During the Design Event?
UPRR	538-623 (19,000-22,000)	No	No
Gold Street	453-509 (16,000-18,000)	No	No (less than 0.10-m clearance at upstream face)
Route 237 (westbound)	524-566 (18,500-20,000)	No	No
Route 237 (eastbound)	241-269 (8,500-9,500)	Yes	Yes
Tasman Drive	382-439 (13,500-15,500)	No	Yes (less than 0.35-m surcharge at upstream face)
Montague Expressway	326 (11,500)	Yes	Yes
Trimble Road	510 (18,000)	No	No (less than 0.25-m clearance at upstream face)
Highway 101	467-496 (16,500-17,500)	No	Yes (less than 0.20-m surcharge at upstream face)
San Jose Airport Parking Lot Access	580-651 (21,000-23,000)	No	No
Airport Parkway	594-637 (20,000-22,500)	No	No
Skyport Drive	651 to over 651 (23,000-over 23,000)	No	No
I-880 (soffit estimated)	Over 651 (Over 23,000)	No	No

3.5 Land Use Limitations

The Lower Guadalupe River is located in the highly developed area in the northern portion of the Cities of San Jose and Santa Clara. Reach A begins at I-880 on the south; Reach G ends at the UPRR Bridge in Alviso on the north. The river flows through industrial, residential, office, and commercial developments. Heavily developed on both sides, there are but a few remaining undeveloped properties whereby opportunities would exist for environmental enhancement, or improvements to the hydraulic properties of the river.

Table 3-4, Undeveloped/Open Properties Within Project Limits, lists the undeveloped or open space properties located adjacent to the river within the project limits. Pertinent information for each property includes assessor parcel number, general location, acreage, zoning, general plan designation, and approximate amount of contiguous river frontage.

Figure 3-8, Potential Staging Areas and Temporary Construction Easements, identifies possible staging areas and temporary construction easements for the LGRP. If the property has been identified as a future construction staging area, this will be noted in the comments section. This table lists properties that appear to be void of any significant structures and could conceivably serve as a form of instream or offstream remediation, trails or parks, or as temporary construction easements. The source of this information was aerial photographs taken in 1999.

3.6 Historic Maintenance Concerns

3.6.1 Erosion and Sedimentation

A Sedimentation Study was prepared for this project (NHC 2000a). The study results concluded that most of the project area, especially the reach between Trimble Road and Montague Expressway, is located in a zone of active channel aggradation. The aggrading sediments are derived from both watershed and tidal sources. The graduation of the aggrading sediments change from gravels and coarse sands in the vicinity of Airport Parkway, and grade down to medium to fine sands from Trimble Road to Tasman Avenue. Downstream from Tasman Avenue, silt and clays from watershed sources are deposited under low flow conditions and daily tidal circulation induces accretion of the tidal marsh plain.

Field surveys, performed in 1991, indicated that the tidal reach from UPRR to Montague Expressway had experienced significant siltation. A memorandum was prepared by the District in November of 1992, to update the Guadalupe River Maintenance Guidelines to reflect observations based on this survey. It was found that silt had deposited in the low flow channel, reducing its top width and expanding the vegetated benches on both sides of the low flow channel.

A detailed description of District routine maintenance practices and procedures is provided in Chapter 6.

3.6.2 Vegetation Growth

Vegetation growth is evident along the maintenance access roads and within the river channel. The EIR contains a more detailed discussion about vegetation types and limits.

Table 3-4

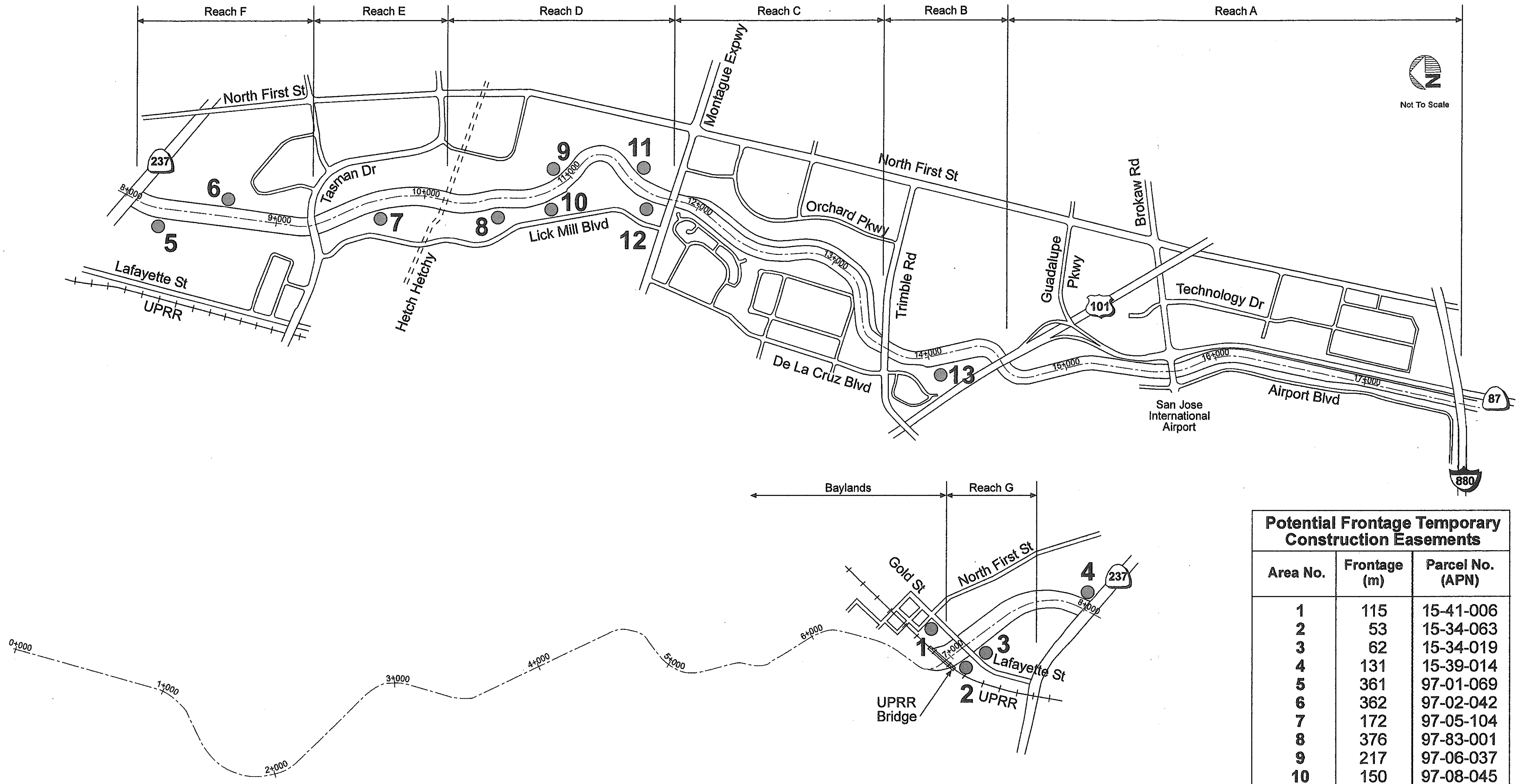
Undeveloped/Open Properties Within Project Limits

Owner - Location - City	APN - Reach	Area (km^2)	General Plan	Zone	Water Front* (m)	Comments
PROPERTIES LOCATED ON THE EAST SIDE OF THE RIVER						
Sainte Claire Corp. - between Gold Street and the UPRR - San Jose	15-41-006 Reach G	2.99478	Mixed Use	C-2	115	
Sainte Claire Corp. - located north (downstream) of Route 237- San Jose	15-39-020 Reach G	42.00786	Mixed Use		420	No new permit applications have been processed to date. No tentative map.
State of California - northeast corner of intersection with Route 237 - San Jose	15-39-014 Reach G	26.98135	Combined Industrial	M-4	131	No new permit applications have been processed to date.
Sylvia Charles J Trust PT - southeast corner of intersection with Route 237 - San Jose	97-01-028	9.18669			206	
Sylvia Charles J Trust PT - located south of Route 237 - San Jose	97-02-042 Reach F	17.64492	Open Space	A (PD)	172	This property is designated as open space from the adjacent development to the north.
Hyundai - northeast corner of intersection with Montague - San Jose	97-06-035 Reach D	46.5405	Industrial Park	I	217	No new permits have been processed.
Agilent Tech. (Hewlett Packard) - located north (downstream) of Highway 101 - San Jose	97-25-068 97-45-021 Reach B	162.9727 223.4349	Industrial Park	IP-b (PD)	107	A tentative map was filed in 1994 for lot reconfiguration. There is an approved "Planned Development" for research and development use.
Atmel Corp - northeast corner of intersection with Highway 101 - San Jose	97-25-011 97-25-078 (No LGR Frontage; 101Frontage = 52 m) Reach B	24.07965 34.56138	Industrial Park	IP-b (PD)	66 0	A tentative map was filed in 1991 on lot 078. Lot 078 has no river frontage but is contiguous with lot 011. There is an approved "Planned Development" for research and development use.

Owner - Location - City	APN - Reach	Area (km^2)	General Plan	Zone	Water Front * (m)	Comments
City of San Jose - southwest corner of intersection with Highway 101 - San Jose	230-01-042 Reach A	68.67759			794	
PROPERTIES LOCATED ON THE WEST SIDE OF THE RIVER						
SCVWD - southwest corner of intersection with UPRR between UPRR and Gold Street - San Jose	15-34-062 Reach G	None provided	Mixed Use	A (PD)	20	
Lincoln 237 Associates LP - southwest corner of intersection w/ Gold Street - between UPRR and Gold Street - San Jose	15-34-063 Reach G	None provided	Mixed Use	A (PD)	53	Tentative map PT97-11-133 filed in 1997. Currently under construction.
State of California - southeast corner of intersection with Gold Street - Santa Clara	15-34-019 Reach G	2.26632	Parks/Open Space		62	Vacant lot. No plans submitted.
Santa Clara Valley Water District - north	15-34-51 Reach G	None provided			335	Strip along waterfront (see below).
Trans County Transport/Santa Clara County Transit District - Santa Clara	15-34-076 15-34-075 Reach G	12.141 5.2611	Parks/Open Space		174 277	Undeveloped open space with detention pond. These parcels have no river frontage, but are adjacent to Lot 51 reference above.
City of Santa Clara - southwest corner of intersection with Route 237- Santa Clara	97-01-069 97-01-068 Reach F	195.1059	Urban Res Parks and Rec	B	361 3	Both properties (landfill -069 and golf course 068) are adjacent and listed together. Opportunity exists to identify remediation sites and begin negotiation with City. No tentative map has been filed to date. These properties should be considered vacant.
City of Santa Clara (Sports and Open Space Authority) - south of Tasman - Santa Clara	97-05-104 97-83-001 97-83-002 (not found) Reaches E and D	148.7192 45.85251 30.71673			172 376	

Owner - Location - City	APN - Reach	Area (km^2)	General Plan	Zone	Water Front [*] (m)	Comments
State of California - northwest corner of intersection with Montague - Santa Clara	97-08-023 97-08-045 Reach D	21.97521 57.79116	Mixed Use Commercial Residential	B	153 150	Both properties are under negotiation for sale to Sun Microsystems and represent current opportunity for remediation sites. Per the City of Santa Clara planning staff 5/26, the "Rivermark" project is in the design phase and would include single family homes, elementary school, fire station, library, and commercial. No formal application submitted yet. No application/plans were submitted for Lot 045, and it is unknown if it will be a part of the Rivermark project. Potential staging area on both lots.
City of Santa Clara - north of Highway 1 and San Jose property - Santa Clara	97-25-023 Reach B	None provided	Agricultural		16	
City of San Jose - northwest corner of intersection with Highway 101 - San Jose	97-25-051 Reach B	None provided	Industrial Park	IP	388	San Jose Airport is constructing a new fuel storage facility, consistent with their approved master plan. Construction likely late 2000 to 2001. Potential staging area.

[*] Approximate contiguous river frontage.



Potential Frontage Temporary Construction Easements

Area No.	Frontage (m)	Parcel No. (APN)
1	115	15-41-006
2	53	15-34-063
3	62	15-34-019
4	131	15-39-014
5	361	97-01-069
6	362	97-02-042
7	172	97-05-104
8	376	97-83-001
9	217	97-06-037
10	150	97-08-045
11	827	97-06-035
12	153*	97-08-023
13	388	97-25-051

*No Frontage.
See 97-08-031 (118 m)
and 97-08-021 (42 m).

Figure 3-8
Potential Staging Areas and Temporary Construction Easements
Lower Guadalupe River Project

CH2MHILL

153735.04.01 StagingAreas.fh9 6/18/01(EG)

3.6.3 Levee Stability

The results of field reconnaissance and geotechnical investigations conducted by URS indicate that the existing levees from UPRR Bridge to I-880 contain numerous animal burrows, cracks, slope erosions, and sloughing (refer to URS Geotechnical Report, Volume I, Table 9: Site Reconnaissance Summary). Loose or soft, uncompacted fills exist along the edges of levees at numerous locations. The URS boring logs indicate that the upper 2 to 4 ft of existing levee fills contain highly expansive clay soils at several locations. As such, the existing levees will need to be upgraded before placing new fill, or installing flood walls on top of it. Generally the levee upgrade work should include removing trees, vegetation, and other debris; stripping all cracks/erosion, sloughing areas and loose or soft soils on edges; sealing animal burrows, and removing the upper 2 to 4 ft of expansive fills, where encountered, and replacing them with compacted select fill.

The extent of levee stripping, excavation, and backfilling and select fill specifications and compaction criteria will be defined during final design.

The existing levees along the project area need to be upgraded to satisfy the FEMA requirements for levee stability. In addition to the general surfacial degradation of levees previously identified, the results of URS' analyses indicate that the structural stability of the East Levee near Station 7+500 is marginal with respect to the minimum required factor of safety under "Sudden Drawdown" condition. The horizontal extent of levee deficiency will need to be defined by additional geotechnical investigations; appropriate levee upgrade measures designed and constructed as part of any proposed flood protection project.

The results of geotechnical analyses by URS indicate that the structural stability of the west levee near Stations 8+610 and 9+570 have marginal factors of safety under Sudden Drawdown and Steady Seepage conditions.

3.6.4 Maintenance Access

A major maintenance concern for the Lower Guadalupe River is the lack of access to the channel. Limited access points make proper maintenance work difficult and costly. Historically, the maintenance work has included sediment and debris removal, tree trimming, erosion repair, and vegetation control. Maintenance crews cannot effectively remove debris, sedimentation, or repair bank erosion without adequate vehicle access.

3.6.5 Environmental Considerations

Some elements of the Lower Guadalupe River flood control maintenance program are permitted by regulatory agencies, including the CDFG. The CDFG is responsible for the protection and conservation of riparian habitats and fish and wildlife resources.

In addition to the CDFG's Memorandums of Understanding (MOUs), a permit from the Corps is required under Section 404 of the Clean Water Act. The permit limits the placement of fill in the creekbed within the ordinary high water boundary. The District's recent regional Corps permit expired in June 1994, and the District is in the process of renewing it. The Corps used to issue 5-year regional permits for routine maintenance.

In the past, individual CDFG permits were required for maintenance activities that constituted a streambed alteration. In August 1990, an MOU concerning routine maintenance activities in improved channels was adopted by the District and the CDFG. The MOU for unimproved channels was adopted in May 1991. These MOUs defined maintenance activities that did not require further notice and agreement in compliance with the CDFG code.

Since 1994, very limited maintenance activities have been accomplished in the Lower Guadalupe River, due to the lack of CDFG permits.

CHAPTER 4
FORMULATION OF ALTERNATIVES

This chapter describes the range of alternatives considered for the LGRP, including those conceptual design concepts that did not undergo detailed analysis. This chapter also includes detailed information on the project design parameters, alternative screening criteria, and in-depth descriptions of the project alternatives to be evaluated in the EIR.

4.1 Purpose and Need for the Project

The purpose of the LGRP is to provide improved flood protection for residents and businesses in the Cities of San Jose and Santa Clara that are located in the floodplain of the Lower Guadalupe River, consistent with the following objectives:

- Protect endangered or threatened species from flood flows conveyed by the river to the extent possible
- Preserve and enhance fish and migratory bird habitat to the extent possible
- Ensure that the project is cost-effective
- Provide opportunities for public recreation/open-space amenities

The District needs additional flood capacity in the Lower Guadalupe River because it does not currently have the ability to convey the Corps' design flood event with a peak flow of 481 cms (17,000 cfs). The District must also implement LGRP improvements before completing the upstream flood control improvements in the Downtown Project of the Guadalupe River to ensure that flood flows in the upper reaches can be carried through the Lower Guadalupe River reaches. The need for LGRP improvements is also well-substantiated by historical flooding and flood damage and hazards in the Cities of San Jose and Santa Clara. Flooding has inundated as many as 2,104 ha (5,200 ac) during the most severe floods (SCVWD 1999). River flooding has caused bank erosion, debris accumulation, sediment deposition, and damage to homes, businesses, roadways, bridges, and other facilities. A design flood flow on the Guadalupe River without the Downtown and Lower Guadalupe River Projects would inundate approximately 3,273 residential units, 951 commercial and industrial properties, and 66 public structures. A total of approximately 4,290 buildings would be flooded, and total flood damages are estimated at $560 million.

4.2 Methodology of Alternative Analysis

The LGRP investigation included a comprehensive process for screening alternatives. The objective of the alternative analysis was to identify alternatives that meet the basic project purpose, can be implemented within the project schedule and at reasonable capital and long-term cost, and meet the project objectives listed above. During the screening process, flood protection solutions that require the minimum modification necessary to solve the problem were preferable.

Based on the District's integrated water resources planning process, a variety of alternatives that would best satisfy all the objectives of the District were evaluated. Each alternative was assessed for effectiveness in addressing problems and minimizing impacts on riparian vegetation, wetlands, wildlife habitat, fisheries, water supply, local drainage, aesthetics, and recreation. To ensure all concerns were addressed, the recommended alternative was developed in close coordination with the City of San Jose, City of Santa Clara, Santa Clara County Parks and Recreation Department, Caltrans, San Jose International Airport, and citizens residing in or owning property in the floodplain of the river. The recommended project was chosen from among all alternatives because it would best protect the community from the design flood, improve water quality in the river, solve erosion problems, improve maintenance access, reduce sedimentation problems, provide continuous fish passage to upstream habitat and a continuous riparian corridor for wildlife, and increase recreational development potential, which complements the county-wide park and trail master plan.

As part of the alternative screening process, input from the public during two project open houses and a public scoping meeting was considered. The purpose of these meetings was to inform the public about progress on the LGRP and to solicit comments from individuals on the range of alternatives that should be considered and the desired contents of the EIR. All of the comments received at public meetings and those contained in comment letters from public agencies and individuals during the EIR scoping process were recorded.

4.3 Screening Process

Specific and consistent criteria were developed to screen the alternatives and determine which practical alternatives would meet the project purpose. Screening criteria included consideration of an alternative's:

- Ability to meet the project purpose
- Ability to be implemented in a reasonable time period
- Capital and maintenance costs
- Environmental effects
- Technical, operational feasibility, jurisdictional, and permitting limitations
- Perceived public acceptance

These screening criteria are defined in more detail below. A tiered approach to the alternative analysis was used. The alternatives were analyzed in three stages.

- **First-Stage Evaluation.** In the first stage, alternatives were analyzed to determine those that would not reasonably meet the overall project purpose, separately or in combination with other alternatives. This stage was used to evaluate conceptual project alternatives or strategies. A comprehensive range of potential solutions was considered to address flood protection on the Lower Guadalupe River. Alternative design concepts ranged from watershed-oriented solutions involving increasing flood storage capacity in upstream reservoirs to more traditional in-channel capacity modifications. During this stage, the screening criteria were not applied in detail to ensure that generally described alternatives that lacked detailed information were not unfairly removed from the process.

- **Second-Stage Evaluation.** A second-stage evaluation was used to further define those flood control concepts carried forward from the first-stage evaluation and to determine whether those alternatives met the screening criteria. The second-stage evaluation analyzed the alternative's ability to satisfy the project purpose in light of the alternative's availability and feasibility with regard to environmental, technological, and cost considerations. This stage was also used to distinguish those elements of proposed flood protection solutions that may not meet the project objectives as a stand-alone project, but that could be combined with other alternative components to create a viable alternative. Detailed analysis was required at this stage to identify clear and compelling reasons for rejecting possible alternatives.
- **Third-Stage Evaluation.** Alternatives that made it through the second-stage screening were compared to the relative feasibility of each remaining alternative and its appropriateness for evaluation in the EIR. Where appropriate, flood protection elements that were determined to be impractical as stand-alone alternatives were combined with viable alternatives to present more comprehensive alternatives. The scope of this third-stage evaluation was commensurate with, and a part of, the environmental impact evaluations completed for the EIR.

4.4 Screening Criteria

Each alternative was evaluated based on a comprehensive set of screening criteria as described below. The screening criteria provide a measure of whether a project alternative would satisfy the basic project purpose and a method by which to determine whether alternatives are feasible and practicable. Each alternative was also evaluated for consistency with District policy, including the Board of Director's Ends Policy.

Screening criteria were based on the following documents:

- Project Directive No. 1 Design Flow Rates and Project Directive No. 1b Modified Design Flow Rates, Hydrology, FEMA Certification, and Levee Certification (SCVWD 2000)
- LGRP Alternatives Summary Technical Memorandum (CH2M HILL 2000c)
- LGRP Project Design Criteria and Alternatives Evaluation Criteria Technical Memorandum (CH2M HILL 1999b)

The following criteria were used to determine whether or not an alternative met the overall project purpose. An analysis of each criterion are described in more detail below.

- Design
- Cost and timing
- Environmental
- Technical, operational, and jurisdictional
- Public acceptance

4.4.1 Design Criteria

Design criteria are used to determine whether or not an alternative meets the overall project purpose of providing improved flood protection for residents and businesses in San Jose and Santa Clara that are located in the Lower Guadalupe River floodplain. The following criteria focus on the hydraulic objectives of the LGRP.

- **Capability to convey design flood flow within District and FEMA guidelines.** The design flow rate is 481 cms (17,000 cfs) downstream of Los Gatos Creek, as developed by the San Francisco District of the Corps of Engineers and reported in its 1977 Hydrologic Office Engineering Report. The design flow rate is consistent with the flows used in the Downtown and Upper Guadalupe River projects, both located upstream of the LGRP. An alternative that is not capable of conveying the design flow rate would not meet this criterion.

  Freeboard criteria used was specified by District's Policy and Procedures. At any cross section, freeboard is the distance between the design-flow water surface elevation and lowest point of the section at which water would overflow. That distance is usually measured from the water surface elevation to the top of a flood-protection feature, such as an earthen levee or floodwall, and to the soffit of bridges and other structures. The following are the minimum freeboard requirements:

  - 1.07 m (3.5 ft) for levee or floodwall section, or two-tenths of the energy grade line, whichever is greater

  - 1.2 m (4 ft) within 30 m (98 ft) of bridges and other constrictions, or two-tenths of the energy grade line, whichever is greater

  - Tapered freeboard would apply between the 1.07 m (3.5 ft) and 1.2 m (4 ft) conditions identified above

  - Freeboard requirements must be retained when flows are super-elevated at channel bends

The following freeboard requirements would apply when the design water surface elevation is below the natural ground that surrounds the channel and where large amounts of vegetation are not anticipated (i.e., excavated or lined channels).

- 0.3 m (1 ft) or two-tenths of the energy grade line, whichever is greater
- Freeboard requirements must be retained when flows are super-elevated at channel bends

An alternative that is not capable of meeting the District and FEMA freeboard requirements would not meet this criterion.

- **Capable of meeting FEMA certification requirements.** All levees and floodwalls must meet FEMA certification requirements through the Corps' Sacramento District Office. An alternative that is not capable of meeting these requirements would not meet the design criterion. The certification requirements include the following:
  - Design of local drainage outfalls to prevent seepage at any time and back flow during flood flows
  - Demonstration that erosion resulting from the design flow current would not result in failure of the levees and floodwalls
  - Engineering analyses demonstrating that seepage resulting from the design flow would not jeopardize embankment or foundation stability
  - Engineering analyses that assess the potential and magnitude of levee settlement resulting from consolidation of the levee embankment or foundation materials
  - Engineering analyses that assess the potential and magnitude of future losses of freeboard resulting from sediment aggradation in the river channel

The LGRP alternatives were designed under the following assumptions:

- **Project Design Life.** The project would serve its intended functions for a design life of 100 years.

- **Channel Roughness.** One parameter used in the design of flood protection channels is the channel roughness factor (Manning's n). A composite roughness factor in many instances is used for non-uniform channel sections. The cross section of a channel may be composed of several distinct subsections with each subsection different in roughness from the others. The composite roughness value is based on a combination of the roughness factors for multiple sections across the channel. Typical roughness values for potential subsections of a channel cross section are shown in Table 4-1.

Table 4-1
Typical Roughness Factor for Ground Cover

Ground Cover Description	Roughness *n*
Maintenance Road	0.028
Sacked Concrete	0.02
Concrete	0.015
Trees	0.06
Willows	0.06
Dense Heavy Tree/Dense Willows	0.125
Mixture of Willows and Trees	0.125
Dry Woody Type	0.03
Grass on Slope	0.025
Long Tules	0.035
Short Tules	0.03
Heavy Mixtures of Tules/Vegetation	0.05
Mixtures of Vegetation	0.2-0.8
Brushes/Heavy Brushes	0.045
Pond	0.055-0.8
Channel Under Water	0.045-0.1

- **Velocity.** Channel erosion and deposition are natural processes needed to maintain a healthy riverine environment. However, erosion may undermine infrastructure, reduce bank stability, and erode spawning gravels. This in turn can affect SRA cover vegetation, in-stream cover, substrate composition, and other components of habitat for aquatic species. Project design features for erosion protection were developed where appropriate, per the Corps guidance documents entitled, "Hydraulic Design of Flood Control Channels (EM 1110-2-1601)" and "Stability Assessment for Flood Control Channels (EM 1110-2-1418)". Where flow velocities exceeded the maximum allowable, armor protection is recommended. Maximum allowable velocities are determined by soil type and channel geometry. A typical range of high velocities is 11.5 to 16.4 feet per second (feet/sec). High velocities in the Lower Guadalupe River were mostly in Reaches A and B and limited areas of Reach C. Values exceeding the maximum allowable velocities would require armor for protection against scouring and to protect fish habitat. Examples of armor protection include rock riprap, gabions, and channel stabilizers.

- **Boundary Conditions.** The target design flood water surface elevation for the LGRP at the upstream end of Reach A (downstream face of I-880 Bridge) was set at or below elevation 17.86 m (58.6 ft; NAVD 88). This was the required downstream boundary condition of the Downtown Project.

  The downstream boundary condition for the Lower Guadalupe River was the 10-year tide elevation in San Francisco Bay. Coincident tidal and design flood elevations were determined at the UPRR Bridge by application of unsteady flow modeling, and sensitivity of the water surface elevation at this location to tide stage. Tidal stage and frequency relationships were obtained from the Corps' San Francisco Bay tidal stage versus frequency (Corps 1984). A 10-year tide of 3.1 m (10.2 ft; NAVD 88) was used as the tailwater condition for this project. It is common Corps' practice to use a 10-year tide elevation with a design flood backwater calculation. This is also a District-adopted standard.

- **Right-of-Way.** Flood protection facilities, including maintenance access, would be on District ROW as determined by either fee title or easement obtained from ROW drawings and parcel maps. New data available for this Engineer's Report are considered preliminary and approximate. Minor ROW encroachments required for each alternative noted in this report are identified more specifically in the EIR.

- **Maintenance Roads.** Maintenance access roads would be provided on both sides of the river channel at top of levee/bank with access from existing public ROW. The maintenance roads would be surfaced with a 0.15-m (6-in) thick layer of aggregate. The roads would be paved with Portland cement concrete where appropriate (e.g., where steeper than 15 percent and beneath bridges).

  Maintenance road widths would allow access for heavy equipment and vehicles along the channel, as follows:

  - 5.5-m (18-ft) clear width at grade and where depressed below top of levees or banks
  - 5.5-m (18-ft) clear width, where elevated (top of levees)
  - 6.7-m (22-ft) equipment swing width
  - 7.6-m (25-ft) clear width passing areas every 150 to 250 m (500 to 800 ft), where more than 300 m (1,000 ft) separates access points
  - 9.1-m by 9.1-m (30-ft by 30-ft) turnarounds, where maintenance road deadends

- **Erosion Control and SWPPP Measures.** The LGRP is subject to stormwater quality NPDES regulations established under Section 402 of the federal CWA. In California, the NPDES program requires that any construction activity disturbing five or more acres comply with the statewide General Permit, as administered by SWRCB. The General Permit requires elimination or minimization of non-stormwater discharges from construction sites and the development and implementation of a Stormwater Pollution Prevention Plan (SWPPP) for the site. The primary elements of an SWPPP include the following:

  - Description of site characteristics including runoff and streamflow characteristics and soil erosion hazard and construction procedures

  - Guidelines for proper application of erosion and sediment control BMPs, including vegetative and structural practices, which are to be delineated on a topographic map

  - Description of measures to prevent toxic materials spills

  - Description of construction site housekeeping practices

  In addition to these primary elements, the SWPPP also specifies that the extent of soil and vegetation disturbance would be minimized by control fencing or other means and that the extent of soil disturbed at any given time would be minimized. The SWPPP must be retained at the construction site. Implementation of the SWPPP would be monitored during LGRP construction; upon construction completion, SWRCB would be notified that all state and local requirements were met.

  As discussed above, the SWPPP includes measures to minimize erosion and sediment movement into the stream. Increased sediment input to the stream has the potential to adversely affect aquatic species and their habitat. An erosion and sediment control plan would be prepared and implemented by the selected contractor(s).

  Elements of the plan would require contractors to complete the following:

  - Conduct all construction work in accordance with site-specific construction plans that minimize the potential for sediment input to the stream

  - Identify with construction fencing all areas that require clearing, grading, revegetation, or recontouring, and minimize the extent of areas to be cleared, graded, or recontoured

  - Grade spoil sites to minimize surface erosion, and apply erosion control measures as appropriate to prevent sediment from entering water courses or the stream channel, to the extent feasible

  - Mulch disturbed areas as appropriate, and plant with appropriate species as soon as practicable after disturbance

  - Avoid operating equipment in flowing water by using temporary coffer dams or another suitable diversion to divert channel flow around the channel and bank construction area

4.4.2 Cost and Timing Criteria

The following criteria were used to determine the cost-effectiveness of the alternatives.

- **Compatible with existing and planned maintenance activities and minimizes maintenance costs.** An alternative must be compatible with current and planned maintenance activities in the Lower Guadalupe River as determined by District maintenance staff. The need and cost of facility, vegetation, and sediment maintenance required for the LGRP should be minimized. Maintaining current flood-fighting capabilities would be required. The appropriateness of LGRP maintenance cost would be evaluated with current maintenance expenditures in the Lower Guadalupe River.

- **Capable of being constructed at a reasonable capital cost.** The project economic criteria focus on identifying the project alternative that would best satisfy the project objectives at the most reasonable cost. For the economic analysis, alternatives were first considered for their ability to meet the project objectives (which have been incorporated into other screening criteria). The alternatives that were not precluded from further analysis based on other criteria were then compared by their estimated costs.

- **Capable of being implemented within a reasonable time period.** June 2004 was identified as the reasonable preferred deadline for implementation of a proposed project. The Downtown Project, located upstream of the LGRP, is scheduled to be completed by June 2004. Once the downtown project is completed, peak flood flows would be able to flow in greater volume to the LGRP. Therefore, the District must implement LGRP improvements before completing flood control improvements in the downtown reach of the river to ensure that flood flows in the upper reaches can be carried through the Lower Guadalupe River reaches. An alternative that could not feasibly be implemented by this time would fail to meet this criterion.

4.4.3 Environmental Criteria

There are a number of areas of the natural and constructed environment that could be affected by construction of flood protection improvements. The potential effects of flood protection improvements on the following major categories of environmental issues would be used in the evaluation of alternatives.

In general, the following alternatives or project components, which have fewer effects on the resources or constraints, would be judged to better meet the environmental evaluation criteria. For an alternative to meet the following criterion, it must not result in major environmental impacts, which have previously been identified as unacceptable, and/or would render the alternative either impracticable or substantially inferior to other feasible alternatives.

- **Allows for opportunities to enhance Lower Guadalupe River environmental conditions.** An alternative must be capable of accommodating opportunities to enhance environmental conditions on the Lower Guadalupe River. Environmental enhancements are defined broadly as projects that could benefit river vegetation and wildlife resources, improve river water quality, improve public access and corridor use, and enhance visual resources in the riverine environment.

- **Does not result in unacceptable environmental effects.** State and federal environmental regulations require disclosure of any major unacceptable environmental impacts associated with each feasible alternative. Certain alternatives may have significant environmental impacts that render them impracticable. Furthermore, Section 404(b)(1) guidelines of the CWA require that an applicant for an individual Section 404 permit ensure that the least environmentally damaging, practicable alternative is used to meet the basic project purpose. In some cases, an alternative would have much greater environmental impacts than other practicable alternatives. In that case, the alternative with major impacts cannot be considered the least environmentally damaging, practicable alternative that meets the basic project purpose.

- **Does not result in impediment to fish migration.** The Lower Guadalupe River primarily serves as a passageway for anadromous fish moving up the river to spawn at higher elevations; however, the fish may also rear in the river, particularly in deeper pool areas. In addition, other native and introduced fish species may inhabit this portion of the river. Alternatives that preserve or improve fish habitat would generally be judged to better meet the evaluation criterion.

  In areas where the low flow channel would be modified by flood protection improvements, the following Thompson criteria would be met:

  – Chinook salmon: minimum depth = 0.25 m (0.8 ft)
  maximum water velocity = 2.4 mps (8 fps)[1]

  – Steelhead trout: minimum depth = 0.18 m (0.6 ft)
  maximum water velocity = 2.4 mps (8 fps)

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[1] mps = meters per second
fps = feet per second

According to this method, both criteria must be met for at least 25 percent of the total transect width and for a continuous portion of at least 10 percent of the total transect width. If both criteria are not met, the critical stream reach is considered a barrier to fish passage.

- **Minimizes effects on wetland resources and SRA habitat.** Wetlands are considered important environmental resources, and filling of wetlands is regulated by the federal CWA and discouraged by other federal and state laws. Alternatives that would minimize impacts on wetlands will generally be judged to better meet this evaluation criterion. During alternative refinement, the effects of alternatives on specific types of wetlands may need to be addressed.

- **Maintaining and improving water temperature.** SRA habitat is critical to maintaining water temperatures that are suitable for aquatic life, including anadromous fish. Alternatives that maintain or improve SRA habitat would generally be judged to better meet this criterion.

- **Compatible with measures to resolve hazardous-materials issues.** Several Lower Guadalupe River segments are known to contain hazardous materials, and the presence of mercury in sediments was identified by the RWQCB as a potential LGRP issue. An alternative that minimizes effects on known hazardous materials sites and is consistent with potential mercury contamination cleanup would generally be judged to better meet this evaluation criterion.

- **Avoids effects on threatened and endangered species.** Special-status species that are known to inhabit the Lower Guadalupe River are Steelhead trout, Chinook salmon, and Snowy plover; therefore, alternatives that minimize adverse effects on endangered species would generally be judged to better meet this evaluation criterion.

- **Minimizes effects on significant archaeological/historical resources.** The Lower Guadalupe River corridor contains several known archeological and historic sites and is considered sensitive and likely to contain additional currently unknown sites. Alternatives that avoid or minimize impacts on important known sites would generally be judged to better meet this evaluation criterion.

4.4.4 Technical, Operational, and Jurisdictional Criteria

Existing technology must be adequate to ensure that the basic project purpose and objectives can be reasonably met. Reliance on questionable or untested technology would expose the District to substantial risk in achieving the basic project purpose. Because meeting flood protection objectives is critical in reducing flood hazards and will be costly with any practicable alternative, implementation of untested or questionable flood protection technology is considered risky, and an alternative that is based on unreasonable property acquisition or geotechnical assumptions is considered impractical. Therefore, the selected alternative would avoid engineering, geotechnical, and property acquisition problems, and questionable or untested technologies.

4.4.5 Public Acceptance Criteria

There are a number of areas along the Lower Guadalupe River where construction of flood protection improvements may have a direct or an indirect effect on the public. The potential effects of alternative flood protection improvements on the following categories were evaluated. In general, alternatives or project components that are perceived by the public to have fewer adverse effects and greater benefit to the public were evaluated to meet the public acceptance evaluation criteria (refer to Appendix C, Public Outreach Plan). The following are public acceptance factors that were considered for each alternative.

- **Improves or accommodates public access.** Public access is currently available on the Lower Guadalupe River levees, but access is restricted, and there are limited formal access locations. Improving or accommodating public access to the river corridor would provide public benefits; therefore, alternatives that maintain or improve public access would generally be judged to better meet this evaluation criterion.

- **Enhances recreational opportunities.** The Lower Guadalupe River currently provides opportunities for recreational activities, such as walking and jogging, but there are few formal recreation facilities or opportunities. Recreational enhancements would provide public benefits; therefore, alternatives that are consistent with future needs to provide recreational opportunities would generally be judged to better meet this evaluation criterion.

- **Maintains and enhances aesthetic values of the river corridor.** The Lower Guadalupe River provides an aesthetic resource in the largely urban surroundings. Reducing the public's perception of the aesthetic value of the river corridor or reducing the public's ability to view the river corridor would most likely be viewed as detrimental. Therefore, alternatives that maintain and enhance the aesthetic values of the river corridor would generally be judged to better meet this evaluation criterion.

- **Minimizes traffic disruption.** Several major, heavily used roadways and freeways cross the Lower Guadalupe River. Alternatives that result in prolonged disruption of traffic patterns are likely to be perceived negatively; therefore, alternatives that minimize traffic disruptions would generally be judged to better meet this evaluation criterion.

The following public outreach program and comments section includes a summary of the stakeholder acceptance process that was conducted for the LGRP. The public involvement effort of the LGRP demonstrates a comprehensive and proactive approach to inviting and responding to public interests related to this project.

Public Outreach Program and Comments

Active public involvement during the planning process increases the chances that an implementable project alternative will be identified. The chosen alternative must be one that can both garner public support and meet the flood protection project objectives.

The Public Outreach Plan (CH2M HILL 2000a) summarizes the District's understanding of the issues and the stakeholders (i.e., affected interests) for the project and describes the program of activities, undertaken by the District, to meet the flood protection project's broad goals and detailed objectives for public involvement. The LGRP Public Outreach Plan is included as Appendix C.

Community Assessment. The early stages of the public involvement effort of the LGRP required exploration of the people and their experience with issues surrounding the project and project area. As a result of this research, a group of stakeholders were interviewed (one-on-one). The interview group included various stakeholders representing civic associations, minority ethnic communities, business associations, environmental organizations, homeowners, and local governments.

The interviews conducted with each stakeholder addressed specific questions as a framework for the conversation. These questions included the following issue areas:

- Familiarity with the District
- Experience with flooding
- Benefits and issues affecting the LGRP
- Appropriate outreach methodology

Public Involvement Challenges and Goals. The individual interviews resulted in detailed explanations of the concerns, issues, and challenges related to flood protection for the Lower Guadalupe River surrounding community. Those interviewed provided additional insight on important contacts, methods for community outreach/education, and project challenges. The following provides a summary of the broad challenges captured through the interview process:

- Diverging views about the project objectives
- Distrust of government officials
- Objectives beyond the project scope
- Project schedule and funding constraints
- Communication barriers (e.g., multiple languages)
- Receiving the public's attention
- Access to business representatives
- Coordinating convenient public meetings

Based on the challenges identified for the LGRP, the following public involvement goals were established early in the project's planning phase:

- Inform the general public and special interest stakeholders about the potential benefits of the project
- Create a variety of outreach activities that build early awareness of the project so that issues can be addressed and incorporated in the planning process, thereby maintaining the schedule
- Solicit ideas and respond to concerns from the general public and special interest stakeholders on the proposed project features
- Provide clear concise information about the project, its goals, and the process for choosing preferred alternatives
- Use familiar communication networks and newsletters to distribute information, thereby reaching people within their area of interest using methods they trust
- Develop opportunities for the divergent interest groups to have open discussions of issues directly related to the LGRP
- Maintain open lines of communication with other affected agencies to improve coordination efforts and build interagency cooperation

To ensure that the project's public involvement goals were met, the goals were transformed into a series of specific activities and tools. The activities and tools formed the basis for the project's Public Involvement Plan. The activities educated the public about the project and granted them sufficient opportunity to provide input during the selection, design, and construction aspects of the LGRP.

Public Involvement Activities and Tools. During the public involvement activities, our public involvement specialists disperse necessary project information among the interested groups and individuals to encourage input in the early planning phases of the project and to gain the stakeholders' support for the chosen flood protection project alternative.

The following list outlines each public involvement task and summarizes the public's response.

- **Updated agency stakeholders through the Watershed Management Initiative (WMI) Flood Management Subgroup:** During this task, regulatory agencies were updated about project issues, and using the WMI forum tested the acceptability of the recommended alternative in the development stages.

  Feedback: The WMI identified key issues dealing with the dredging alternative and aggressive vegetation management.

- **Conducted individual and customized stakeholder meetings:** During this task, the public involvement specialists showed customized presentations explaining the project to the stakeholders, and often gained valuable input from them.

  Presentations or meetings were held with the following groups:

  - Mujer Latina Discussion Group
  - The Alviso Rotary Club
  - The Santa Clara Valley Manufacturing Group-Environmental Subgroup
  - The Peninsula Industry and Business Association
  - The Coyote Guadalupe Resource Conservation District
  - San Jose International Airport
  - Various government agencies
  - Santa Clara Valley Transportation Authority
  - Santa Clara County Department of Parks and Recreation

  Feedback: Presentation recipients were responsive and appreciative of the outreach efforts. The concerns represented ranged from construction impacts/noise and intergovernmental coordination to the loss of fish habitat.

- **Facilitated public meetings:** Public meetings provided an informal forum for community members to receive project information, ask questions and express concerns. Community meetings were conducted in an open house format and at convenient, public locations along the Lower Guadalupe River corridor. In addition, a formal scoping meeting and two public hearings are required to meet the needs of NEPA/CEQA. To involve and educate project stakeholders, the District has chosen to exceed NEPA/CEQA standards for public outreach through additional outreach meetings and activities.

  Feedback: An average of 30 to 50 participants attended the public meetings. Many of the public meeting attendees were residents of the project area. The major concerns captured through the meeting process included protection of property interests, environmental concerns, health and safety, river maintenance, and recreational opportunities.

- **Prepared and maintained stakeholder matrix:** Using the District's GIS system, a project specific mailing matrix was developed. The matrix encompassed the entire flood zone affected by the Lower Guadalupe River. The matrix was reduced in size as a result of a business reply card where 2 percent of the respondees wished to continue receiving project information. However, for public meetings, a new matrix was created for those living within 304 m (1,000 ft) of the project area.

  Feedback: Ongoing additions and deletions were completed after each mailing and public meeting to ensure that all interested members of the public were included.

- **Provided a project hotline:** The 24-hour phone message line provided convenient customer service for project-related questions.

  Feedback: The hotline received the majority of calls before and following the public meetings, which included various requests for information or receiving RSVPs for the public meetings.

- **Circulated e-mail and newsletter copies to special interest newsletters:** Written updates were sent to key agencies' newsletters and e-mail distribution lists. The updates included discussion on important project issues and upcoming meetings.

  Feedback: Government agencies, environmental groups, and civic groups were recipients of this targeted information to retain and solicit further interest and feedback. Requests for project presentations to individual groups resulted from this effort.

- **Prepared project newsletters:** Written project updates were provided to interested members of the public on the mailing matrix and at identified distribution locations. The project newsletters were prepared in English and Spanish and included valuable information on public involvement activities, public concerns, project progress, study results, and opportunities for public comments. The newsletter distribution corresponded with important project events.

  Feedback: Requests were received for additional project newsletters and supplied to public agencies and civic groups as project information updates.

- **Created and maintained a project web site:** Provided easy access to the project background information, meeting summaries, and upcoming project events to the public.

  Feedback: Several requests were received for the web site address. Information requests and questions were also received via the project web site email link.

- **Designed a Project PowerPoint™ Presentation:** This task included the creation of an adaptable PowerPoint™ presentation of the project planning process, alternatives, and evaluation results. The presentation was designed to be flexible and adaptable for different stakeholder meetings and groups presentations. Throughout the life of the project, a considerable number of presentations were provided to civic, environmental, governmental, and other interested parties. The Guadalupe Coyote Resource Conservation District, Downtown Collaborative, Alviso Rotary, and Santa Clara County are examples of presentation recipients.

  Feedback: The PowerPoint™ presentation created interest in the project and initiated questions at public presentations.

Summary of Issues Received Through Public Outreach Efforts. The LGRP's extensive public involvement tasks solicited feedback from a variety of stakeholders. Table 4-2 (on the following pages) includes stakeholder comments, which are grouped by residents and civic organizations; environmental groups and agencies; and business interests and organizations.

4.5 First-Stage Evaluation

The first-stage evaluation was used to determine those flood control strategies that would not reasonably meet the overall project purpose.

4.5.1 First-Stage Alternatives and Results

Ten general categories of alternatives were analyzed during the first-stage screening evaluation. Descriptions of the general categories of alternatives are presented below. These general categories are as follows:

- No-Project alternative
- Non-Structural alternative
- Upstream Floodwater Storage alternative
- Fluvial Geomorphological alternative
- Change in Upstream Reservoir Operations alternative
- Watershed Transfer alternative
- Off-Stream Storage Basin alternative
- New Channel Construction alternative
- Channel Bank Modifications alternative
- Channel Bypass alternative

Table 4-2
Stakeholder Comments on Relevant Project Issues

	Stakeholder		
Topic of Concern	**Residents and Civic Organizations**	**Environmental Groups and Agencies**	**Commercial Interests and Organizations**
Property Interests	- Prevention of residential property damage is a serious concern. - Improved sewer and storm drainage systems are also necessary. - Lowering the cost of flood insurance is important.	- The setback levee option should be investigated even if additional right-of-way must be obtained. - There is an assumption that the salt pond easements or property will be obtained and the ponds will be restored to the natural Baylands habitat.	- Coordination with businesses is critical to ensure facilities are not damaged during construction or as a result of the project improvements. - Temporary traffic and construction annoyances are acceptable; however, long-term disruption or worsening of traffic problems is not. - The project must provide additional security and protection for businesses against flooding, the disruption of future business activity, and the protection of valuable inventory.
Environmental Concerns	- Potential contamination by mercury and heavy metals in the river sediment. - Ensure that impacts to fish and wildlife are appropriately addressed. - Coordinate with other products in the watershed.	- Special Status Species must be considered for each alternative. - Flood plain restoration should be investigated as the preferred alternative. - Destroying and damaging existing fish and wildlife habitat, river temperature, and vegetation is a primary concern. - The river serves a larger purpose in the environment and wildlife habitat and is not only a drainage mechanism.	- Many businesses in the area would support environmental issues due to the positive impacts on quality of life for employees.
Health and Safety	- Emergency preparedness to ensure personal health and safety, as well as the safety of local children is critical.	- Mercury hot spots should be identified through the environmental permitting process and opportunities to intercept mercury throughout the project should be investigated.	- Increased quality of life as a result of the project is beneficial to the attraction and retention of workers.
Maintenance	- Vegetation needs to be removed to allow views of the water. - Sediment must be removed from the river. - Garbage should be regularly removed. - The life span of the project's improvement must be seriously considered. - Dredging is an important alternative.	- The extent of vegetation management to be conducted under each alternative is of concern. - The cost of maintenance requirements should be provided for each alternative. - Channels should be designed to transport sediments naturally.	- Impacts to adjacent business for long-term maintenance is an issue.

	Stakeholder		
Topic of Concern	**Residents and Civic Organizations**	**Environmental Groups and Agencies**	**Commercial Interests and Organizations**
Recreation and Aesthetic Enhancements	- Positive aesthetic enhancements can increase adjacent property values. - Public access brings concerns of crime and loitering. - Views of the river are important. - Residents expect that access to the river and levee trails will continue and be enhanced	- Recreational enhancements should not be at the detriment to fish and wildlife habitat. - Connections, coordination, and compliance with existing trails and planned trails are imperative.	- Employees enjoy recreational enhancements along the river for exercise and lunch.
Alternatives	- Transferring water to the bay and adding more concrete to increase river flows will cause Alviso to continue to flood. - Dredging only to the UPRR may put people in Alviso at greater risk. - Increased levee size would block views and access to the river. - Do not add more pumped flows into the river. The capacity of the river must be increased to handle the 100-year flood flows. - The chosen alternative should represent the least impact to the natural habitats, which include preserving riparian vegetation and settling back levees as far as possible.	- Water quality impacts, sediment sampling (mercury), and impacts to shaded riparian areas must be investigated and properly mitigated for any alternative. - The ability to satisfy all regulatory requirements is critical. - There is support for a restorative approach as opposed to hardscaping. - Significant issues should be addressed, such as the use of appropriate stabilization materials (native grasses), establishing a larger floodplain through land acquisition, sediment removal, and avoidance of flood wall usage to minimize erosion.	- The alternative that provides a combination of enhanced flood protection, quality of life, and is completed with the least impact to area businesses is preferred.

No-Project Alternative

Consistent with state CEQA Guidelines Section 15126.6(e), the EIR will include an evaluation of a No-Project alternative even though this alternative would not meet the objectives of the project. CEQA requires a description and an analysis of a no-project alternative (hereafter called the No-Project Alternative) to allow decision makers the opportunity to compare the impacts of approving a proposed action with the impacts of not approving a proposed action. The No-Project alternative assumes existing conditions at the time that the Notice of Preparation (NOP) was circulated, which, for the LGRP, was April 19, 2000; it also assumes the conditions that would be expected to result in the foreseeable future under current maintenance practices if the Proposed Action were not approved. New flood protection construction features would not be implemented under the No-Project alternative.

The No-Project alternative includes the following flood-control features: continuation of current routine vegetation and sediment management activities, and continuation of routine inspections and maintenance of levees and access roads.

The continuation of sediment management would involve minor, periodic removal of sediment deposits in confined problem areas, such as those found at approaches to bridges, near drainage facilities, or on maintenance roads. Sediment management would also include the removal of debris, rubbish, and other channel obstructions in Reaches A through G.

The continuation of current vegetation management would involve the mechanical and chemical control of woody and flexible vegetation in Reaches A through E to maintain the current vegetative cover, avoid overgrowth in the channel, and preserve the current channel capacity. Limited vegetation management was conducted in Reaches F and G because of regulatory restrictions on vegetation removal in these areas. Vegetation management includes control of weeds and grasses and the removal of vegetation from maintenance roads, channel bottoms at bridges, and levee banks. Vegetation management also includes removal and control of woody or herbaceous vegetation in Reaches B through E. Vegetation control in Reach A is limited because of proposed Corps and Caltrans mitigation plantings in this area, but it would resume in areas outside the mitigation plantings once a mitigation framework is in place. Vegetation management may also include removal and control of woody or herbaceous vegetation in all reaches. Vegetation is typically removed by mowing, discing, hand labor, herbicide application, and removal of sediment.

Facility maintenance under the No-Project alternative would include maintenance of levee and access roads including routine inspections and minor repairs to access roads, drainage outfalls, and levee structures (e.g., filling holes, repairing slumping levee banks, and ensuring structural stability).

Under this alternative, no direct action would be taken to reduce the existing flood hazard on the Lower Guadalupe River. The Downtown Project would not be in operation. Residents and businesses within the borders of the floodplain would continue to face hardships (e.g., bank erosion, debris accumulation, sediment deposition, and damage to homes, businesses, roadways, bridges, and other facilities) as a result of flooding. A design flood flow on the Guadalupe River without completion of the Downtown and Lower Guadalupe Projects would inundate approximately 3,273 residential units, 951 commercial and industrial properties, and 66 public structures. A total of approximately 4,290 buildings would be flooded, and total flood damages are estimated at $560 million for the long term. Annual flood damages would be expected to average about $26 million.

Under this alternative, residents of businesses would continue to face hardships as a result of flooding and flood insurance would continue to be required. This alternative does not facilitate opportunity to remove mercury-laden sediments. In addition, maintenance access and potential trail access are limited. The No-Project alternative is considered infeasible and impracticable because of its high cost in damages. The No-Project alternative does not solve the flooding, water quality, and environmental problems. With no action, the channel capacity will continue to diminish.

Non-Structural Alternative

The Non-Structural alternative would prevent the flooding of structures in the floodplain without channel modifications. The structures subject to potential flood damages would be flood-proofed or purchased and removed. Affected streets and public areas would still be subject to frequent flooding.

This alternative would result in the need to relocate numerous residences and businesses. The need to acquire all potentially flooded structures makes this alternative prohibitively costly, which could be as high as billions of dollars. Additionally, the alternative would not resolve frequent flooding on streets and public areas. Because this type of alternative does not meet the overall purpose of the project and cannot be completed in a timely manner and at a reasonable cost, it was removed from further consideration.

Upstream Floodwater Storage Alternative

The Upstream Floodwater Storage alternative would include constructing a new dam in the Guadalupe River Watershed and enlarging existing dams. The following options for new upstream floodwater storage were studied in the Guadalupe Watershed Planning Study (SCVWD 2000) and in the Downtown Guadalupe River General Re-Evaluation and Environmental Report (Corps 2000).

- New Guadalupe Dam: Construction of a new 20-m (65-ft) high dam approximately 3,220 m (2 mi) downstream of the existing Guadalupe Dam
- Hooker Dam: Construction of a new dam upstream from Lenihan Dam, located between Lenihan and Austrian Dams

- Raise Lenihan Dam: Raising of Lenihan Dam by about 7.6 m (25 ft) to provide 8 x 10^6 m^3 (15,000 af) of flood storage capacity

The previous analyses removed various possible flood storage options from consideration for the following reasons.

- **New Guadalupe Dam.** Construction of a new dam approximately 3,220 m (2 mi) downstream of the existing Guadalupe Dam was considered. The new dam would be 20 m (65 ft) high and have the capacity to capture the entire 100-year-flood hydrograph at that location. This plan was removed from further study when analysis showed that the dam would not provide 100-year-flood protection farther downstream along the Guadalupe River in downtown San Jose and the Lower Guadalupe River because of additional inflows between the dam and San Jose during a one percent storm event. Therefore, this plan did not meet the LGRP design flood flow conveyance criterion. The plan also did not meet the capital cost criterion or the timing criterion for the LGRP.

- **Raise Lenihan Dam.** The raising of Lenihan Dam by about 7.62 m (25 ft) to provide 8.5 x 10^6 m^3 (15,000 af) of flood storage capacity was considered. This would reduce the design flood flows in the Lower Guadalupe River from 481 to 312 cms (17,000 to 11,000 cfs). This alternative, therefore, meets the design criteria for conveying the design flows. However, raising the dam would require the relocation of a water treatment plant and portions of a state highway (Route 17) and could result in environmental impacts associated with inundation of existing habitats. Additionally, this alternative would not meet the timing criterion and could take up to 10 to 15 years to complete. For these reasons, this alternative was removed from further consideration.

- **Hooker Dam.** Construction of a new dam upstream from Lenihan Dam was considered to provide additional flood protection storage and increased flood protection for the Guadalupe River. The dam would be located midway between Lenihan and Austrian Dams. This plan was eliminated from further study because the drainage area tributary to the proposed facility would be only 44 km^2 (17 mi^2) and would not provide the flood protection needed. Therefore, this alternative would not meet design criteria for the LGRP and was removed from further consideration.

Fluvial Geomorphological Alternative

A fluvial geomorphological alternative to stream restoration was considered for all reaches. This approach proposed to construct a meandering multi-staged channel consisting of: a thalweg or low flow channel; a bankfull channel, which contains the sediment carrying or channel-forming flow; and a terraced floodplain that carries the high flows. The multi-staged channel design would accommodate future changes in the river system as well, allowing the river channel to achieve a dynamic equilibrium. Erosion and sedimentation problems would be minimized and maintenance cost reduced. An opportunity would be provided for significant new riparian vegetation to reestablish and for a functional physical and biological river system that allows natural processes to occur while restoring and maintaining habitat values for fish and wildlife.

This alternative would necessitate widening the floodplain of the river and complete reconstruction of a meandering geomorphological bankfull channel, incurring major impacts to the existing native riparian vegetation and SRA habitat, fisheries, and adjacent homes and businesses. The river would be allowed to move (i.e., meander) within a wide corridor and would move sediment efficiently through the system without ongoing maintenance. Based on historic data of the Lower Guadalupe River, this would require a meander belt for the river of approximately 500 m (1,640 ft) wide.

Re-establishing the historic stability of the river using a 500-m (1,640-ft) wide floodplain is not practicable because it would require setting back the levees, the purchase of approximately 5.3 km^3 (cubic kilometer; 1,310 ac) and relocation of substantial numbers of homes and businesses. The fluvial geomorphological alternative was rejected because it would cost more than one billion dollars.

Change in Upstream Reservoir Operations Alternative

This alternative would involve modifying existing operations of the Lenihan Dam at Lexington Reservoir for the dual purposes of flood protection and water supply. Re-operation of Lenihan Dam would require lowering the water level before the flood season. This would result in an estimated 8.6 x 10^6 m^3/yr (7,000 af/yr) loss in water supply. The District would need to purchase water from sources outside the watershed to make up the losses. The projected costs to purchase the lost water supply were about three times the average annual benefits, making this plan infeasible. Therefore, this alternative would not meet the capital cost criterion for the LGRP and was removed from further consideration.

Watershed Transfer Alternative

This alternative would involve diverting Guadalupe River floodwaters into neighboring Coyote Creek Watershed to reduce the peak flow rate in the river. A minimum of 85 cms (3,000 cfs) would have to be transferred from Guadalupe River to Coyote Creek under this alternative.

This alternative would not meet the objectives of the LGRP because a suitable discharge location is not available; neighboring rivers and creeks adjacent to the Guadalupe River are also experiencing flooding problems. Preliminary evaluation indicated that this alternative would not meet the design flood flow or capital cost criteria. Therefore, this alternative was removed from further consideration.

Off-Stream Storage Basin Alternative

For the Off-Stream Storage Basin alternative, peak flood flows would be diverted through a diversion structure into an off-stream storage site, which would reduce the Guadalupe River peak flow rate. Floodwater storage capacities in excess of 2.44 x 10^6 m^3 (2,000 af) would be required, which is equivalent to a 809,374 m^2, 3 m deep (200-ac, 10-ft deep) pond.

The off-stream storage alternative is restricted by the availability of off-stream storage sites. To be effective, the storage site would have to be located at the upstream end of the channel reach and have a minimum capacity of 2.44 x 10^6 m^3 (2,000 af). Based on a reconnaissance review of the project vicinity, no feasible off-stream basin sites are available. Therefore, this alternative was considered infeasible.

New Channel Construction

The option of constructing a new channel from the UPRR to the San Francisco Bay (Bay) was evaluated. This concept resulted from a recommendation received at a public outreach meeting. The concept would include construction of a new channel from UPRR (through Ponds A5, A7, and A8W) to the Bay that could have multiple uses such as flood control for the southern watershed, access for water transportation around the bay, and provide new development of wetlands.

The new channel would extend from Alviso and would be cut (through Cargill Ponds A5, A7, A8W, and a portion of A6). The channel dimensions would be approximately twice the estimated size of Alviso slough (Figure 4-4) to provide flood conveyance. Initial construction would require major import of fills to construct a new levee system to confine the new channel and dredging up to a few meters in the existing ponds. Construction of the new channel would provide opportunity to restore the remainder of the ponds to wetlands and provide mitigation to the project impacts. The new construction would also provide opportunity for water transportation from Alviso to the Bay.

This alternative would only provide flood conveyance from the Bay to Alviso. This dredged channel would be tidally submerged and would therefore not provide the lowering of tailwater conditions to significantly improve the water surface elevations in the Lower Guadalupe River. Hydraulic analysis of the Guadalupe River indicates that the tide affects the water surface elevation in the Guadalupe River as far upstream as Montague Expressway. This alternative would still require channel modifications in the Lower Guadalupe River from UPRR at Alviso to I-880. This alternative would affect a few miles of wetlands from the construction of the new levee system and from the dredging activities. A preliminary cost estimate shows that this alternative could cost about $65 million to construct the new channel, excluding mitigation, hazardous materials handling, and maintenance activities. The cost for mitigation, hazardous material handling, and maintenance could be significant. Because of the aggressive and dynamic marsh accretion rate in this area (about 0.2 m [8 in] per year), at least 50,000 m^3 (65,400 yd^3) of sediment would need to be removed per year to maintain the channel geometry for flood conveyance and water transportation. In addition, the cost of required channel modifications from UPRR to I-880 ($44 million to $71 million) is not included in the $65 million estimate.

This alternative is considered infeasible and impracticable because (1) the hydraulic benefit is not sufficient to eliminate the need for channel modifications and associated impacts in the study area; (2) there would be substantial impacts to sensitive plant communities such as salt marsh, brackish marsh, diked salt marsh (habitat for the clapper rail), and freshwater marsh habitat; (3) the cost of construction, mitigation and maintenance is too high; and (4) the alternative does not meet the overall purpose of the project and can not be completed in a timely manner at a reasonable cost.

Channel Modification Alternative

The Channel Modification alternative would include in-stream modifications in the river between I-880 and the UPPR crossing. In-stream channel modifications would include the following:

- Channel bank modifications
- Levee paving
- Levee raising
- Floodwalls
- Setback levees
- Bridge crossing modification
- Channel excavation and dredging
- Sediment removal and management program
- Vegetation removal and management program

These elements involve changes to the existing levee and channel structure.

The Channel Modification alternative was identified as a potential alternative that could significantly lower water surface elevations in the Lower Guadalupe River. The proposed elements of the Channel Modification alternative use a combination of techniques to both increase channel capacity and lower the Manning's *n* value, thereby reducing the water surface elevations. The techniques described in this alternative vary in their effectiveness, cost, timing, environmental impacts, and public acceptance. However, because these techniques meet the overall project purpose and are technically feasible, this alternative has been carried forward to the Stage 2 evaluation. During the Stage 2 evaluation, individual components of the Channel Modification alternative will be evaluated further for their effectiveness and feasibility.

Channel Bypass Alternative

The Channel Bypass alternative includes construction of an open (aboveground) or buried conveyance structure inside each levee or outside the existing channel prism. The open channel or box culverts would require dimensions from 10 to 15 m (32.8 to 49.2 ft) in width and between 3.5 and 5 m (11.5 and 16.4 ft) in height to convey up to a maximum of 85 cms (3,000 cfs). The bypass structure(s) would extend from a location immediately downstream of the Highway 101 Bridge to a location shortly downstream of Gold Street Bridge.

An aboveground bypass, embedded in the existing levee system, that conveys approximately 50 percent of the design flood flow could lower the water surface elevation in the channel to meet the hydraulic design criteria for conveyance and freeboard. Therefore, this alternative meets the design flood flow criterion and could be constructed as a stand-alone design that meets the project objectives.

Based on preliminary evaluations, an underground bypass, also embedded in the existing levee system, is more feasible because locations for an open channel are constrained by existing structures, and constructing an underground bypass structure could be designed to avoid long-term environmental impacts in the channel, including impacts on wildlife habitat, wetlands, SRA habitat, and fish passage and habitat. Preliminary capital costs for this alternative are high, and it is uncertain whether this alternative could be constructed within the proposed time period for the LGRP. This alternative does however, meet most of the design criteria and therefore it has been carried forward to the Stage 2 evaluation.

Figures 4-1, 4-2, 4-3, and 4-4 display the ten original conceptual options analyzed during the screening evaluation.

Based on the first-stage screening evaluation, the components of the Channel Modification alternative and the Channel Bypass alternative were carried forward to the second-stage screening evaluation.

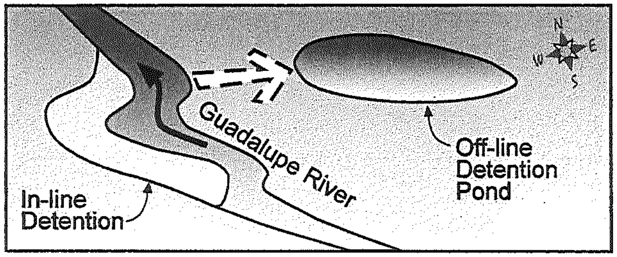
4.6 Second-Stage Evaluation

4.6.1 Second-Stage Alternatives and Results

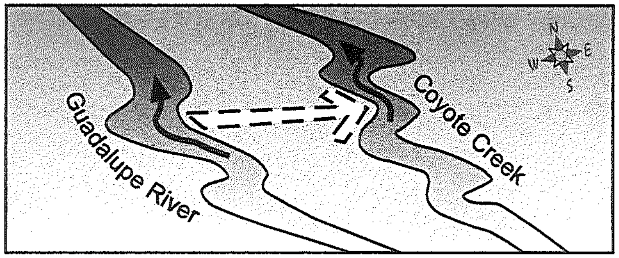
During the second-stage screening analysis, nine components specific to the channel modification alternative were identified for evaluation. These components were evaluated for their potential to meet the project objectives and screening criteria.

The components of the Channel Modification alternative were evaluated as independent alternatives during the second-stage evaluation. These alternatives include levee paving, levee raising, floodwalls, setback levees, bridge crossing modifications, channel excavation/dredging, sediment management, and vegetation management. The second-stage evaluation distinguishes elements of proposed flood protection solutions that may not meet the project objectives as a stand-alone project but that could be combined with other alternative components to create a viable alternative. Because the Channel Bypass alternative was identified as a stand-alone alternative during the first-stage evaluation, it was carried forward and evaluated in detail in the third-stage evaluation.

Upstream and Offstream Storage

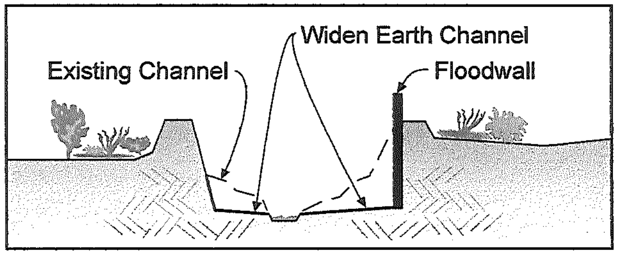


Watershed Transfer

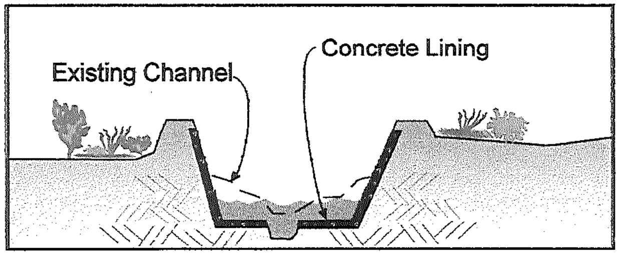


CHANNEL MODIFICATION

Channel Bank Modification and Floodwall

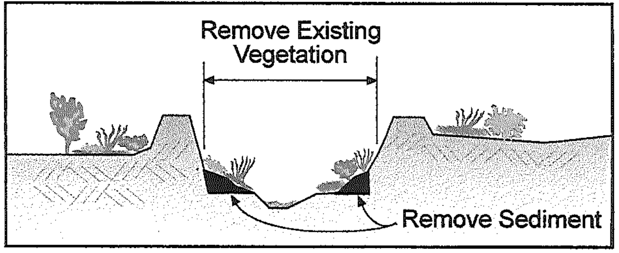


Levee

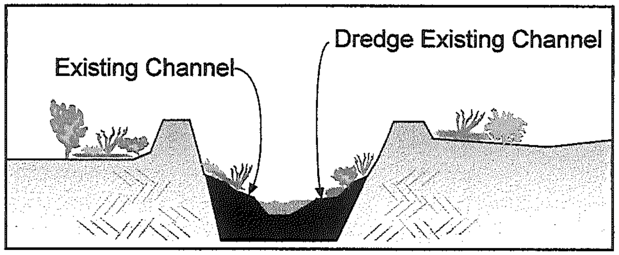


CHANNEL MODIFICATION (cont.)

Sediment/Vegetation Management



Dredging Channel



Floodwall/Raise Levee

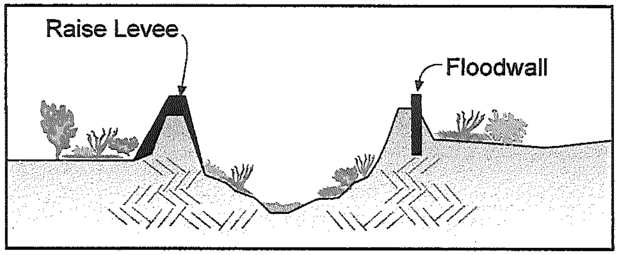
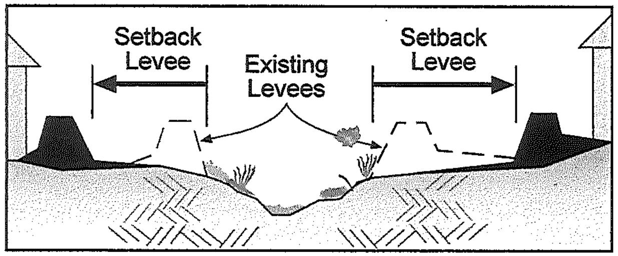


Figure 4-1
Conceptual Options (1 of 4)
Lower Guadalupe River Project

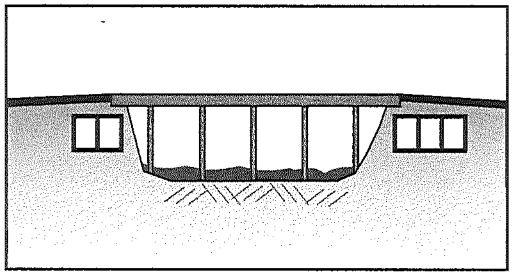
CHANNEL MODIFICATION (cont.)

Setback Levees

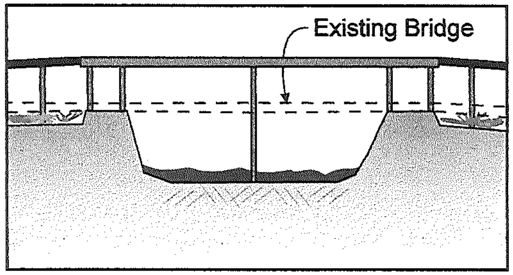


Bridge Modification

Improve conveyance by addition of culverts.

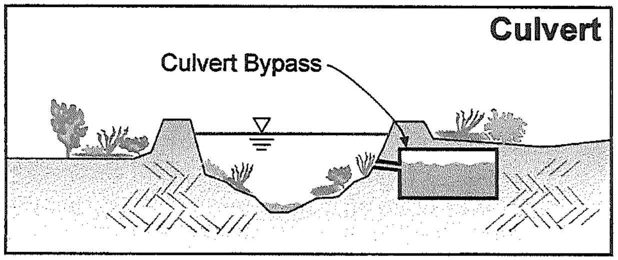


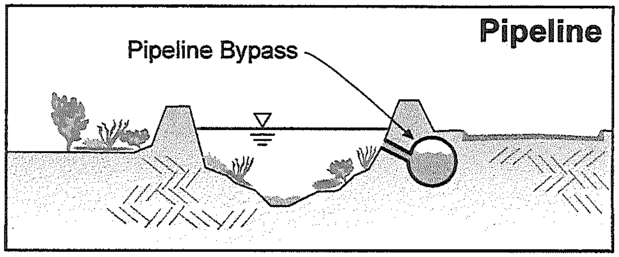
Raise or reconstruct bridge.



CHANNEL BY-PASS

By-pass Options





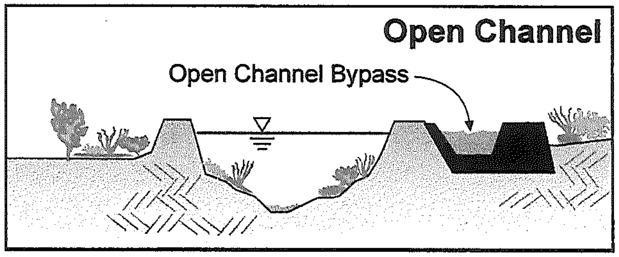
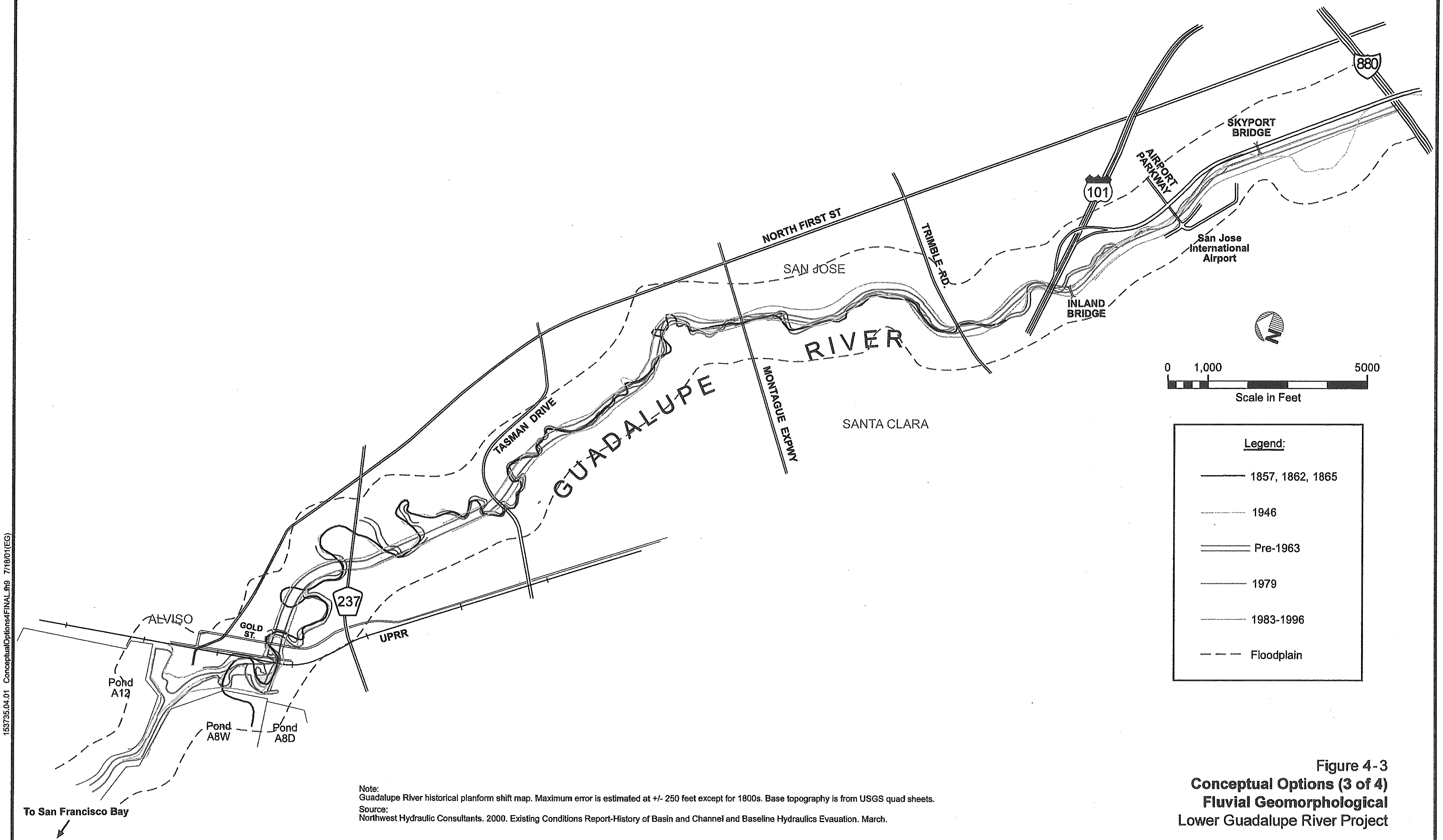


Figure 4-2
Conceptual Options (2 of 4)
Lower Guadalupe River Project



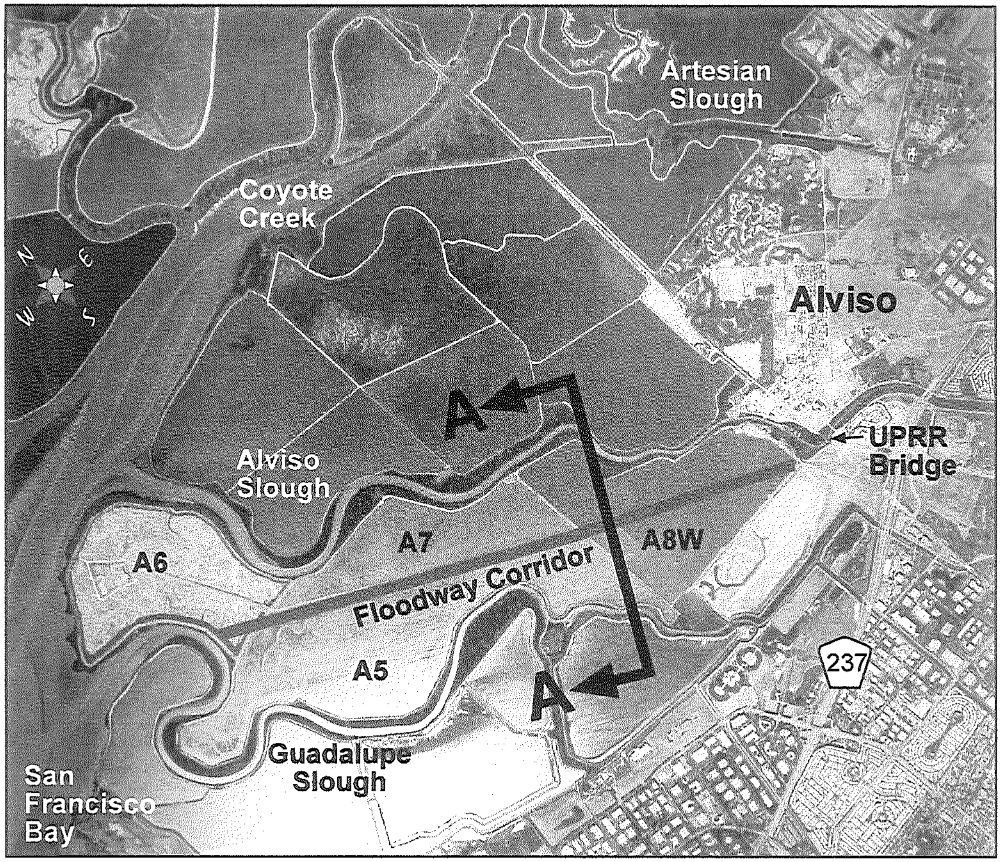
Note:
Guadalupe River historical planform shift map. Maximum error is estimated at +/- 250 feet except for 1800s. Base topography is from USGS quad sheets.
Source:
Northwest Hydraulic Consultants. 2000. Existing Conditions Report-History of Basin and Channel and Baseline Hydraulics Evauation. March.

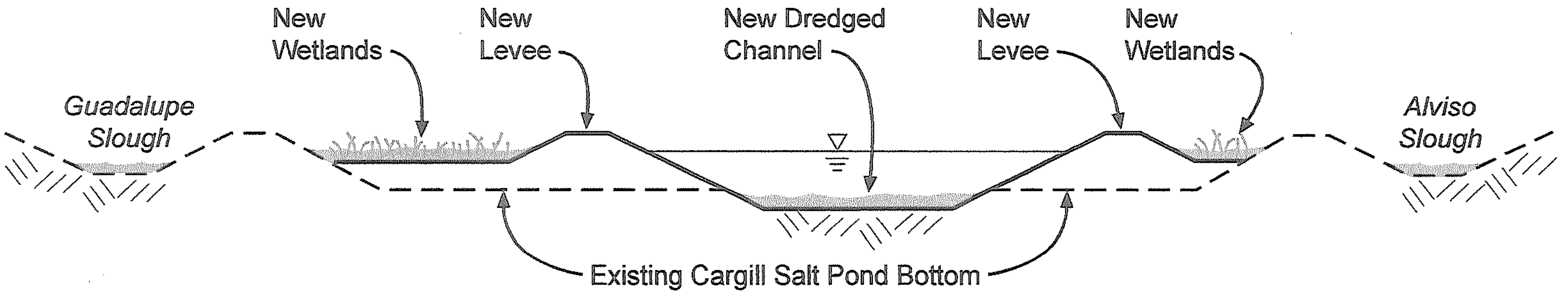
Figure 4-3
Conceptual Options (3 of 4)
Fluvial Geomorphological
Lower Guadalupe River Project

CH2MHILL

153735.04.01 ConceptualOptions4FINAL.fh9 7/18/01(EG)

153735.04.01 FloodwayCorridorFINAL.fh9 7/26/00(EG)





Section A-A

Not To Scale

Figure 4-4
Conceptual Options (4 of 4)
New Channel Construction UPRR to the Bay
Lower Guadalupe River Project

CH2MHILL

Channel Bank Modification Alternative

The Channel Bank Modification alternative involves excavating the inboard slope of the levees and constructing a vertical or near-vertical retaining wall along the exposed surface of the excavated levee. The retaining wall and apron would be resurfaced with materials such as mechanically stabilized earth (MSE), architecturally treated concrete, or biostabilization, to create lower roughness conditions. The exposed surface of the retaining walls would be as high as 4 m (13.1 ft). These improvements would take place from the Montague Expressway to the UPRR Bridge crossing. Levee modifications would both increase channel capacity and lower the roughness conditions (i.e., Manning's *n* value), thereby reducing the water surface elevations.

The Channel Bank Modification alternative was identified as a potential stand-alone concept that could significantly lower water surface elevations in the Lower Guadalupe River. Hydraulic analyses indicate that modifying the channel from Montague Expressway to the UPRR Bridge, with the addition of a Route 237 bypass or bridge raising, could lower water surface elevations by up to 2 m (6.6 ft), allowing the design floodflow conveyance criterion to be met. Improvements inboard of either levee may be limited to reduce potential impacts on jurisdictional wetlands. As with most channel modification options, interference and relocation of existing utilities are expected. This alternative was also judged to meet the other design criteria including the capital cost criterion and could be constructed in a manner that meets most of the environmental, technical, jurisdictional, and public use criteria. This alternative was carried to third-stage screening. The Channel Bank Modification alternative could include any of the components described below.

Levee Paving Alternative

This alternative involves lining the inboard levee surface from levee top hinge point to levee toe to decrease the channel roughness. These improvements would extend from Highway 101 to the UPRR Bridge crossing.

This alternative is similar to the levee Channel Bank Modification alternative in that it lowers the roughness of the high flow surface areas of the channel. However, levee paving does not provide significant increased hydraulic capacity in the downstream reaches of the LGRP where capacity is most limited. Therefore, this alternative would not meet the design floodflow criteria and is considered infeasible.

Levee Raising Alternative

East and west levees along the existing banks would be raised to confine the design flow to the channel. This alternative requires raising levees in some reaches as high as 1.5 m (4.92 ft) from their existing heights. Where a levee is found to be substandard, the levee would be reconstructed to meet adequate factors of safety for structural stability and raised to the minimum freeboard height requirement. This alternative would provide adequate freeboard in accordance with the

District's and FEMA levee policy. Raising the levee with conventional sloped sides would increase the footprint.

Raising existing Lower Guadalupe River levees by up to 1.5 m (4.92 ft) would require expanding the outboard and inboard levees onto land adjacent to the existing ROW and would encroach into existing buildings, parking lots, other constructed facilities, or inboard into wetlands. Additional ROW in some cases would be purchased and adjacent structures would be relocated from approximately Montague Expressway to the UPRR crossing on both the east and west sides of the river. Costs for these acquisitions would not meet the capital cost criteria.

This alternative could require expansion inboard of the existing levees where ROW to expand outboard is not available. This would result in increases in the Lower Guadalupe River design water surface elevations and overtopping of most of the bridges. This alternative as a stand-alone would not meet the design floodflow criterion. However, raising levees to less than 1 m (0.3 ft) could be an appropriate component to the flood control program in areas where adjacent land is available for ROW acquisition or where only a minor difference exists between the design water surface elevation and current levee heights. In this capacity, this alternative was considered feasible and practicable.

Floodwall Alternative

Under this alternative, the existing levee height would be augmented with reinforced concrete floodwalls on top. Floodwall heights would range between 0.5 and 1.5 m (1.6 and 4.92 ft). The location of the wall on the levee would be determined by structural stability and by the minimum 5.5 m (18.04 ft) maintenance vehicle access road width. To allow for maintenance access from the bridge access points to the channel, ramps would be needed over the walls.

Constructing concrete floodwalls on existing Lower Guadalupe River levees could be designed to accommodate flood flows and be constructed for a reasonable cost; therefore, this alternative would meet the design flood flow and capital cost criteria. This alternative would avoid encroachment into wetlands or private ROW that could result from raising the levee. Interference and consequent relocation of existing utilities would be expected. This alternative would also meet the environmental criteria because construction would not involve modification of fish or wildlife habitat, and no wetlands would be affected by these structures. The alternative also meets most of the public use criteria, although constructing large segments of concrete floodwall from upstream of Montague Expressway to the UPRR Bridge could be an aesthetic concern depending on the height of floodwalls that are needed. Overall, this alternative would meet the majority of screening criteria and was carried to the third-stage screening.

Setback Levees Alternative

Levees along the east and west banks would be relocated outboard from the existing levee to provide increased channel capacity and freeboard. This alternative would provide for the removal of the levees from their existing locations and constructing new levees approximately 50 m (164 ft) outward from the existing levees, thereby increasing channel conveyance.

This type of setback would require purchase of approximately 20 ha (50 ac) of occupied property, which could cost more than one billion dollars, and substantial relocation of homes, businesses, and public facilities. Therefore, this alternative was considered infeasible and impracticable.

Bridge Crossing Modification Alternative

Bridges that create a significant constriction to the flow in the channel would be raised or modified under this alternative. Additional channel capacity at the approaches could be necessary, and abutment toe slopes would be reconstructed. If a bridge soffit can not be raised, the construction of a waterproof parapet wall would be built on the bridge to the elevation of the maximum freeboard required. Raising the existing bridges would remove a flow constriction and reduce the backwater effects and consequent increased water surface elevations caused by the bridges. Culverts could also be constructed adjacent to the bridge to add conveyance.

This alternative would involve raising the bridges and/or removing abutment slopes. The hydraulic benefit is slight for all bridges with the exception of the eastbound Route 237 Bridge, which appears to be a major constriction. Interference and consequent relocation of existing utilities would be expected Raising of the eastbound Route 237 Bridge could be an appropriate component to the flood control program. Therefore, this alternative as a component was considered feasible and practicable.

Channel Excavation/Dredging Alternative

This alternative consists of increasing the channel prism by dredging material inboard of the existing levee toes. The channel would be dredged to create a trapezoid that has approximately a 40-m (131-ft) base width, and 2H to 1V side slopes. All wetland and riparian habitat would be removed and not allowed to re-establish. An objective of this design is to create enough conveyance in the channel so that no floodwall or levee raising would be necessary. The channel would be dredged as often as needed to maintain the project design capacity.

The dredging concept meets most of the hydraulic objectives of the LGRP. The water surface elevation decreased from Montague Expressway to Tasman Drive by up to 3 m (9.8 ft). Compared to other concepts, the dredging concept capital costs would be low, but long-term maintenance costs would be higher than those under all other concepts. The recurring cost for maintenance of the dredged conditions would be prohibitive for the 100-year life of the project. Because no new capital improvements would be required, this concept could be implemented in a short amount of time compared to other concepts. Interference and consequent relocations of existing utilities would be expected. This alternative could have positive effects related to potential mercury or other hazardous materials assuming cleanup of known areas would be required during dredging activities.

This alternative would not meet environmental and jurisdictional criteria. This alternative does not allow for environmental enhancement of the river corridor and would necessitate removal of nearly all of the highest quality wetland and SRA habitat from Montague Expressway to the UPRR Bridge. Approximately 20 ha (50 ac) of wildlife, wetland, and SRA habitat would be removed. Most of the remaining fisheries habitat that currently exists in the low flow channel would be lost. Under this alternative, fish and wildlife resources in the Lower Guadalupe River would decline from present conditions. Depending on the method and depth of dredging, this alternative represents a higher risk to buried archaeological resources than other concepts.

Channel excavation/dredging is a relatively simple flood control solution that could provide clear flood control benefits. This alternative would most likely not affect the current levee access, but would result in a substantial change in visual resources from a relatively lush riparian/wetland corridor to a channelized flood control facility. The dredging alternative would avoid traffic disruptions and construction nuisance, but most likely would not meet aesthetic, recreational enhancement, and public access criteria.

Because this alternative would have excessive mitigation and maintenance requirement and does not meet environmental criteria, it was rejected from consideration as a stand-alone solution.

During open house and scoping meetings, a number of participants requested that dredging be considered as a viable element of the project. Specifically, residents requested that the District consider removing sediment between the Marina Outlet and Route 237 to improve flood flow capacity and navigation. Because of this concept's ability to meet the design flood flow criterion and the public interest expressed at project meetings, it was carried to the third-phase screening process as an element of a larger flood control solution.

Sediment Management Alternative

Under this alternative, a sediment removal schedule would be developed to prevent sediment accumulation and maintain channel capacity. This alternative differs from the channel excavation/dredging alternative in the magnitude of sediment removed; less sediment would be removed under the sediment management alternative than the channel excavation/dredging alternative.

A sediment management program that would result in less sediment excavation in the channel than what is considered under the dredging concept would not meet the flood protection objective of the LGRP because it can not create needed capacity. Therefore, this alternative was rejected as a stand-alone alternative. However, sediment management is recognized as an important LGRP component that would influence the size, type, and location of flood protection structures that may be needed on the Lower Guadalupe River.

Vegetation Management Alternative

This design alternative entails intensive maintenance to remove channel vegetation to maintain lower channel roughness conditions.

A vegetation management program in the Lower Guadalupe River would not meet the flood protection objective of the LGRP; therefore, this alternative is not a viable stand-alone design concept and was rejected from further evaluation. However, vegetation management combined with sediment management is recognized as an important LGRP component that would influence the size, type, and location of flood protection structures that may be needed on the Lower Guadalupe River.

Based on this second-stage evaluation, the Channel Bypass alternative, the Channel Bank Modification alternative including Floodwall/Raise Levee and Dredging alternatives, along with the No-Project alternative required for CEQA, were carried forward to the third-stage screening evaluation. Table 4-3 includes a summary of the comparison of design concepts in meeting screening criteria.

4.7 Third-Stage Evaluation

Based on the first- and second-stage screening analyses, a short list of four alternatives was identified. The alternatives meet the design flood and freeboard criterion and the minimum requirements for the other screening criteria. The third-stage alternative screening compares each of the short-listed alternatives to the relative ability to meet the cost, timing, environmental, and public acceptance criteria. The objective of the third-stage screening is to identify alternatives to be addressed in the EIR.

4.7.1 Third-Stage (Short-Listed) Alternatives and Results

The short-listed alternatives are as follows:

- Channel Bypass alternative
- Channel Modification alternative
    - Channel Bank Modification alternative
    - Floodwall/Raise Levee alternative
    - Dredging alternative

Table 4-3
Comparison of Design Concepts in Meeting Screening Criteria ("Matrix")

Problems, Concerns, and Impacts	Conceptual Alternatives										
	Existing Conditions	**No-Project**	**Non-Structural**	**Upstream Floodwater Storage**	**Fluvial Geomorphological Realignment**	**Change in Upstream Reservoir Operation**	**Watershed Transfer**	**Offstream Storage Basin**	**New Channel Construction (UPRR to Bay)**	**Channel Modification**	**Channel Bypass**
Description of Conceptual Alternative	Guadalupe River is susceptible to water quality degradation and lacks adequate channel capacity to safely convey the design flow rate. Portions of existing levee system do not meet FEMA requirements.	No direct action would be taken to reduce the existing flood hazard. Residents and businesses in the floodplain would continue to face hardships. Mandatory flood insurance required. FEMA certification of levee jeopardized.	Structures subject to potential flood damage would be flood-proofed or purchased and removed. Affected streets and public areas would still be subject to frequent flooding.	A new dam downstream of New Guadalupe Dam and one upstream of Hooker Dam would be constructed. Leniham Dam would be raised. Significant channel modifications would be required from UPRR to I-880.	A meandering multistage channel consisting of low flow channel, bankfull channel, and terraced floodplain would be constructed to accommodate future river changes.	Operations of Leniham Dam at Lexington Reservoir would be modified to provide flood protection as well as water supply. Significant channel modifications would be required from UPRR to I-880.	Guadalupe River floodwaters would be diverted into neighboring Coyote Creek watershed to reduce the peak flow rate in the LGR. Significant channel modifications would be required from UPRR to I-880.	Peak flood flows would be diverted through a diversion structure into an off-stream storage site to reduce the LGR peak flow rate.	Conveyance of Guadalupe River flows through the Alviso Baylands to San Francisco Bay would be improved by dredging Alviso slough or constructing a new floodway corridor through Cargill ponds. Significant channel modifications would be required from UPRR to I-880.	Existing channel in-stream would be modified by altering banks, levee paving, levee raising, floodwalls, setback levees, modifying bridges, dredging, and removing and managing sediment and vegetation.	Buried conveyance structure would be constructed inside each levee.
Flooding Problems	High risk of flooding. Mandatory flood insurance will be continued.	Existing condition would remain. Annual flood damages are expected to be $26 million. Long-term flood damages are expected to be $560 million.	Frequent flooding of streets and public areas would continue resulting in disruption of services and access.	Construction of additional dams would not provide the flood protection needed for the LGR. Significant channel modifications would be required.	This alternative would eliminate the flood threat in the LGR floodplain.	Change of reservoir's operation alone would not eliminate the threat of the design flood and mandatory flood insurance. Additional measures would be needed. Significant channel modifications would be required.	Transfer of floodwaters to a neighboring watershed would only relocate the problem. Coyote Creek Watershed does not have the capacity to accept additional flood flows. Significant channel modifications would be required.	Offstream ponds alone would not eliminate the threat of the design flood and mandatory flood insurance. Additional measures would be needed. Significant channel modifications would be required.	Dredging UPRR to the Bay alone does not provide any flood protection to the LGR from UPRR to I-880. Significant channel modifications would be required.	Combinations of this alternative would eliminate the design flood threat from the LGR floodplain.	This alternative would eliminate the existing flood threat from the LGR floodplain.
Maintenance Concerns	Intense maintenance is required to manage vegetation and remove sediment. Maintenance access is poor.	Current routine sediment and vegetation management is limited but would continue.	Current routine sediment and vegetation management is limited but would continue.	Current routine sediment and vegetation management is limited but would continue.	Erosion and sedimentation problems would be minimized and maintenance costs reduced.	Current routine sediment and vegetation management is limited but would continue.	Current routine sediment and vegetation management is limited but would continue.	Current routine sediment and vegetation management is limited but would continue.	Aggressive marsh accretion rates would require removal of 50,300 m^3 of sediment per year.	A routine maintenance plan would be adopted to preserve the channel modification project design.	A routine maintenance plan would be adopted to preserve the channel modification project design.
Erosion Problems	There are limited localized bed and bank scour problems at channel constrictions.	Existing condition would remain.	Existing condition would remain.	Existing condition would remain.	Project would be designed to accommodate local scour and deposition.	Existing condition would remain.	Existing condition would remain.	Existing condition would remain.	Existing condition would remain.	Revetment or channel bed stabilization would be added as part of project design.	Existing condition would remain.
Sedimentation Problems	Periodic removal of sediment in the channel bottom required.	Existing condition would remain.	Existing condition would remain.	This would require less frequent sediment removal in Reaches B and C.	Project would be designed to accommodate local scour and deposition.	This would require less frequent sediment removal in Reaches B and C.	Existing condition would remain.	Existing condition would remain.	Existing condition in the LGR would remain.	Sediment removal would be included in the adopted maintenance plan.	Sediment removal would be included in the adopted maintenance plan.
Local Drainage Problems	There is a long duration and high frequency of flooding and local ponding in adjacent streets.	Existing condition would remain.	Existing condition would remain.	The duration and frequency of flooding in the streets and local ponding would decrease slightly.	The duration and frequency of flooding in the streets and local ponding would decrease.	The duration and frequency of flooding in the streets and local ponding would decrease slightly.	The duration and frequency of flooding in the streets and local ponding would decrease slightly.	The duration and frequency of flooding in the streets and local ponding would decrease slightly.	The duration and frequency of flooding in the streets and local ponding would not decrease.	The duration and frequency of flooding in the streets and local ponding would decrease slightly.	The duration and frequency of flooding in the streets and local ponding would decrease slightly.
Water Quality Problems	Degraded water quality.	Existing condition would remain.	Existing condition would remain.	Improvements would occur in water quality because of improved river environment.	Possible increased degradation of water quality. A geomorphic solution would encourage channel meandering, which may cause a loss of SRA resulting in increased water temperatures. Also, a migrating channel could mobilize additional mercury-laden sediments.	Improvements would occur in water quality because of improved river environment.	Improvements would occur in water quality because of improved river environment.	Improvements would occur in water quality because of improved river environment.	Water quality would remain or worsen.	Water quality would be improved.	Water quality would remain or worsen.

Problems, Concerns, and Impacts	Conceptual Alternatives										
	Existing Conditions	No-Project	Non-Structural	Upstream Floodwater Storage	Fluvial Geomorphological Realignment	Change in Upstream Reservoir Operation	Watershed Transfer	Offstream Storage Basin	New Channel Construction (UPRR to Bay)	Channel Modification	Channel Bypass
Water Supply Impacts	Limited water supply potential.	Existing condition would remain.	Existing condition would remain.	Reservoir water storage capacity would be increased in the summer months.	Existing condition would remain.	Reservoirs would be kept empty during winter months at the cost of $5 million/year. Supplemental water may not be readily available for purchase. Federal and state regulations may exist that impact the ability to import water to the county.	Existing condition would remain.	This would potentially increase groundwater recharge potential in the summer months at the off-stream ponds.	Existing condition would remain, if not worsen.	Existing condition would remain.	Existing condition would remain.
Riparian Vegetation Impacts	Degraded and discontinuous riparian corridor.	Existing condition would remain, if not worsen.	Existing condition would remain, if not worsen.	Existing condition would remain, if not worsen.	System would become more dynamic. The composition of vegetation could be highly variable after flood events.	Existing condition would remain, if not worsen.	Existing condition would remain, if not worsen.	Existing condition would remain if not worsen.	Existing condition would remain, if not worsen.	Slight improvement. Areas subject to scour would be protected and infill plantings would be included as project mitigation.	Slight improvement. Areas subject to scour would be protected and infill plantings would be included as project mitigation.
Wetland Impacts	Moderate wetland habitat.	Existing condition would remain.	Existing condition would remain.	Existing condition would remain.	System would become more dynamic. The composition of vegetation could be highly variable after flood events.	Existing condition would remain.	Existing condition would remain.	Existing condition would remain.	Substantial loss of tidal wetlands would occur.	Recurring loss of wetland due to maintenance requirements.	Recurring loss of wetland due to maintenance requirements.
Wildlife Habitat Impacts	Moderate wildlife habitat.	Existing condition would remain, if not worsen.	Existing conditions would remain, if not worsen.	Major impacts to 2.57 kilometers and 67.58 hectares of riparian vegetation at reservoir sites would occur. Major impacts to wetlands at reservoir sites and from channel modifications would occur.	System would probably have a greater diversity of wildlife habitats.	Existing condition would remain.	Existing condition would remain.	Existing condition would remain.	Substantial loss of tidal wetlands that possibly support special status species would occur.	Recurring loss of habitats due to maintenance requirements.	Recurring loss of habitats due to maintenance requirements.
Fishery Impacts	Degraded fish habitat due to high water temperature and lack of cover.	Existing condition would remain, if not worsen.	Existing condition would remain, if not worsen.	Major impacts to fish habitat at reservoir sites.	Due to the texture of the substrate and the channel slope the river would become wider and more shallow, possibly creating fish passage barriers. May also cause increased water temperatures due to reduction in SRA.	Major impacts to fish habitat at reservoir sites and from channel modifications. Loss of water releases from reservoirs in summer months.	A continuous low-flow channel would be needed to maintain fish habitat.	A continuous low-flow channel would be needed to maintain fish habitat.	Fish habitat would be disturbed significantly and not allowed to re-establish due to required annual dredging.	Fish habitat would be preserved.	Fish habitat would be preserved.
Aesthetic Impacts	Degraded aesthetic qualities caused by concrete and sacked concrete used for erosion repair, high levees, vegetation growth, and nonpoint source pollution.	Existing condition would remain, if not worsen.	Existing condition would remain, if not worsen.	Existing condition would remain.	Enhanced natural appearance.	Existing condition would remain.	Existing condition would remain.	Existing condition would remain.	Aesthetic impacts would be significant during construction.	The aesthetic value of the river corridor would be maintained and enhanced.	The aesthetic value of the river corridor would be maintained and enhanced.
Recreation Impacts	Limited recreation usage at top of levee.	Existing condition would remain, if not worsen.	Existing condition would remain, if not worsen.	Increase recreation area at reservoirs during the summer months.	Existing condition would remain.	Increased recreation areas created around floodwater storage facilities.	Existing condition would remain.	Increased recreation areas created around floodwater storage facilities.	Recreation areas around the LGR would remain if not worsen. Navigation through the Baylands would improve.	Maintains and enhances existing and future recreation plans by the cities of San Jose and Santa Clara.	Maintains and enhances existing and future recreation plans by the cities of San Jose and Santa Clara.
Implementation Cost at 2001 Present Worth	N/A	N/A	$500 million (+)	$200 million (does not include additional channel modification costs)	$1 billion (+)	$136 million (does not include additional channel modification costs)	$500 million (+) (does not include additional channel modification costs)	$680 million (does not include additional channel modification costs)	$65 million (doesn't include mitigation and additional channel modifications [$44 to $71 m])	$44 to $71 million	$200 million
Time to Complete Project	N/A	N/A	Indefinite	50 years	Indefinite	20 years	Indefinite	Indefinite	10 years	2 to 3 years	4 to 5 years
Summary		Considered infeasible and impracticable because of the high potential cost in flood damages. Does not solve the flooding, water quality, and levee rehabilitation problems, nor improve recreation access to river.	Considered infeasible and impracticable because it does not meet project purpose schedule requirements; does not rehabilitate existing levees and would cause undue hardship on business during flood events.	Not selected because of the substantial impact to the riparian ecosystem and high construction cost.	Would require the purchase of 263 hectares of expensive land, and relocation of numerous homes, businesses, and portions of San Jose International Airport and reconstruction of 8 to 10 roadway bridges. Concept was found infeasible and too costly.	Not selected because of substantial adverse impacts on availability of water and uncertainty of relying on additional imported water and schedule constraints.	Does not meet design floodflow and capital cost criteria. Considered infeasible because the neighboring watershed (Coyote Creek) cannot handle additional floodflows.	Not selected because of the high capital cost of purchasing land for storage basin and indefinite construction schedule. Limited nondeveloped land available in lower watershed.	Considered impracticable and infeasible because it does not meet the overall project purpose and cannot be completed in a timely manner and at a reasonable cost. Potentially significant environmental impacts to mitigate.	Selected because it achieves most of the District's goals and objectives.	Selected because it meets most of the District's goals and objectives.

Channel Bypass Alternative

As described in first-stage screening, this alternative includes the construction of a buried conveyance structure inside each levee or outside the existing channel prism. The box culverts would require a width of 8.5 m (28 ft) and between 3.5 and 5 m (11.5 to 16.4 ft) in height to convey up to a maximum of 85 cms (3,000 cfs). An effective bypass system would compensate for the lack of capacity in the main channel. The bypass structure(s) would extend from a location immediately downstream of the Highway 101 Bridge to a location shortly downstream of the Gold Street Bridge.

By reducing flows in the main channel, the Channel Bypass alternative would meet the 1.09-m (3.5-ft) freeboard requirement on the levees and the 1.22-m (4-ft) freeboard requirement 30 m (98 ft) upstream and downstream at bridges. However, this alternative would cost two to three times more than the viable channel modifications (e.g., floodwalls, channel bank modifications and dredging). This alternative would also require at least an additional year in construction time compared to the levee modification and floodwall alternatives. Interference and consequent relocation of existing utilities and a major disturbance of cultural resources would likely occur.

Long-term environmental effects of this alternative could be minimal because the bypass structures would be hidden in the Lower Guadalupe River levees and thus would avoid substantial effects on the riparian corridor, SRA habitat, and low flow channel. Construction of this alternative would result in short-term effects on wetland and wildlife habitat at the bypass culvert entrances and exits. Those areas affected by construction of the bypass would need to be restored to current conditions.

This alternative provides opportunities to maintain and enhance public access, recreational opportunities, and aesthetics because only limited structures would need to be constructed in the river corridor.

This alternative would result in substantially greater traffic disruptions than under other alternatives because of the need for substantial levee excavation and placement of large bypass structures. Construction of the bypass at bridge crossings would be particularly complex.

Channel Bank Modification Alternative

As indicated in the second-stage screening, the Channel Bank Modification alternative would meet all of the screening criteria. Capital costs of this alternative would be almost $78 million. This alternative would require a construction time of 2 years.

Overall, the Channel Bank Modification alternative would meet the environmental criteria because its structural elements would be compatible with enhancing the river corridor and would avoid placing flood control structures in channel overbank and low flow channels, where most of the riverine/aquatic habitat is located. This alternative is compatible with objectives to provide an alternative that is consistent with efforts to improve hazardous materials and mercury contamination conditions. Construction of the structural elements would require removal of inboard levee sideslopes, which contain traces of hazardous materials.

This alternative would also meet most of the public use criteria. Most channel bank modification structures would be constructed with alternate (other than concrete) materials that are compatible with maintaining the aesthetic nature of the river corridor. Project construction would require implementation of a traffic control plan to minimize traffic disruption on local roadways. Safety railings would be included, as necessary, on steep banks or vertical walls, per Occupational Safety and Health Act (OSHA) standards.

Floodwall/Raise Levee Alternative

The Floodwall/Raise Levee alternative would meet all of the screening criteria. A general public concern is the appearance and height of the exposed wall. This alternative would meet the capital cost, timing, and environmental criteria. However, constructing a concrete floodwall on existing levees (combined with some levee raising) could result in a substantial change in the visual character of the river corridor and could possibly restrict further public access and recreational opportunities. The evaluation of whether the change in visual character is considered a substantial aesthetic effect would depend on the magnitude of the change and will be addressed in the EIR. Additionally, the floodwalls could restrict the amount and desirability of public/recreational access on Lower Guadalupe River levees.

Dredging Alternative

This alternative includes channel excavation up to 3 m (10 ft) deep from levee toe to levee toe (downstream of UPRR to Montague Expressway). The construction cost for conducting the channel excavation is approximately $56 million the first year, with approximately $80 million for maintenance over the life of the project. Preliminary estimates for mitigating on purchased undevelopable land is $28 million and $400 million for developable land. The total cost for construction, maintenance, and mitigation is between $162 and $534 million, depending on the type of land available for mitigation.

Based on a comparison of the added cost to the added benefit of excavating the channel, the costs greatly outweigh the flood control benefits. Additionally, channel excavation would result in the removal of wetlands habitat, and fish habitat and is not consistent with the environmental criteria for the project (refer to the Channel Excavation/Dredging alternative in second-stage evaluation). Preliminary feedback from the regulatory agencies indicates that the impacts of this alternative would be too significant. This alternative was therefore considered infeasible and impracticable and was not evaluated in the EIR.

Figure 4-5, Formulation of Alternatives in Screening Stages, includes the entire range of alternatives considered for the LGRP. As shown, the alternatives were either carried forward to the next stage of evaluation or did not meet the screening criteria and therefore were found to be impracticable or infeasible.

153735.04.02 StagesFINAL.fh9 7/18/01(EG)

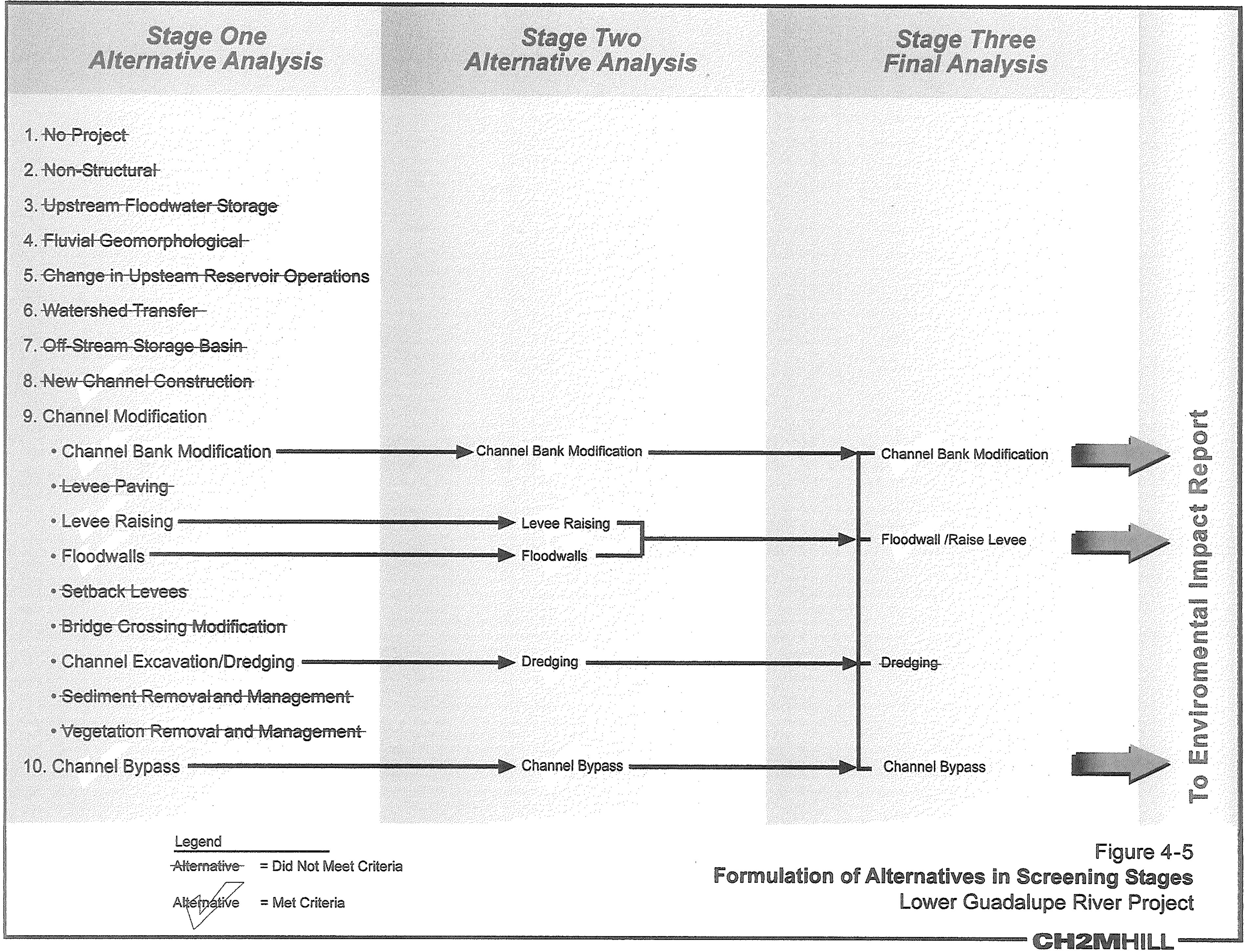

Stage One
Alternative Analysis
Stage Two
Alternative Analysis
Stage Three
Final Analysis
1. ~~No Project~~
2. ~~Non-Structural~~
3. ~~Upstream Floodwater Storage~~
4. ~~Fluvial Geomorphological~~
5. ~~Change in Upsteam Reservoir Operations~~
6. ~~Watershed Transfer~~
7. ~~Off-Stream Storage Basin~~
8. ~~New Channel Construction~~
9. Channel Modification
• Channel Bank Modification
• ~~Levee Paving~~
• Levee Raising
• Floodwalls
• ~~Setback Levees~~
• ~~Bridge Crossing Modification~~
• Channel Excavation/Dredging
• ~~Sediment Removal and Management~~
• ~~Vegetation Removal and Management~~
10. Channel Bypass
Channel Bank Modification
Levee Raising
Floodwalls
Dredging
Channel Bypass
Channel Bank Modification
Floodwall /Raise Levee
~~Dredging~~
Channel Bypass
To Enviromental Impact Report
Legend
~~Alternative~~ = Did Not Meet Criteria
Alternative = Met Criteria

Figure 4-5

Formulation of Alternatives in Screening Stages

Lower Guadalupe River Project

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4.7.2 Feasible and Practicable Alternatives

The following three alternatives were short-listed because they met all of the design, environmental, and schedule objectives of the project. The alternatives are presented with expanded descriptions and discussion of relevant information and issues concerning each.

Channel Bank Modification Alternative

This alternative involves the excavation of the inboard toe of the existing levees, construction of a vertical or near-vertical wall at the inside top of the levee hinge point, and construction of a sloped apron at the resulting channel bench. Preliminary hydraulic modeling indicates that velocities would be low enough that the channel wall and apron do not need to be a hard material (e.g., concrete, asphalt, and rock) and may be constructed of alternate materials. Hard surface channel walls and aprons would provide the lower channel roughness, increasing hydraulic capacity, which may be needed in some locations. Materials appropriate for the walls would be concrete interlocking blocks, MSE, gabions (gravity wall constructed of stacked wire baskets filled with rocks), and crib walls. Alternate materials for the apron are Geoweb mats, turf-block, or articulated concrete mattresses (ACMs). A high-strength material would be needed to serve as a maintenance access road. A description by reach is provided later in this chapter.

The work for this alternative would not likely encroach into wetland areas because work would be performed above the existing wetland edge. Under this alternative moderate to aggressive maintenance would be required to optimize the hydraulic capacity of the channel, which includes vegetation and sedimentation management.

The proposed maintenance activities for this alternative would be similar to those in the Floodwall/Raise Levee alternative and are described in detail in Chapter 6 of this report. The maintenance plan is required to obtain the maximum reduction in water surface and meet the desired freeboard condition.

The preliminary cost estimate for this alternative is approximately $78 million.

Hydraulic Analysis. Manning's *n* roughness values used in the hydraulic analysis corresponded to the vegetation and sediment management program detailed in Chapter 6 of this report. The *n* values used for the main channel vary from 0.027 to 0.037 throughout the study area. The *n* values used outside of the main channel were based on the optimal, or a recently maintained, vegetation (cut to 0.3 m [1 ft] high) and sedimentation (fully excavated) management condition. In Reaches D, E, F, and G, the *n* value for the excavated vertical channel wall is 0.035, while the sloped apron has a *n* value of 0.022. The selection of these *n* values for the vertical channel wall and sloped apron allows for the construction of these features using any of the alternate materials.

The roughness value used to model the channel wall resulting from excavating the levee toe is reflective of a vegetation-lined and maintained wall, while the *n* value used for the sloped apron is reflective of a maintained turf block. The selection of materials with less roughness would result in reduced water levels in Reaches D, E, F, and G. Further hydraulic analysis during final design would be required to establish the benefits of a channel wall or sloped apron material with less roughness.

To maintain the design flood elevation of 17.86 m (58.6 ft; NAVD 88) at the I-880 Bridge, aggressive vegetation management was required for 120 m (394 ft) downstream from the bridge. This decreased *n* value of 0.03 for the entire channel contrasts with the maintained areas outside of the SRA mitigation sections from 0.037 for the main channel, 0.1 for buffer areas, and 0.04 for the overbanks. There is no buffer zone adjacent to the main channel for this aggressively maintained reach.

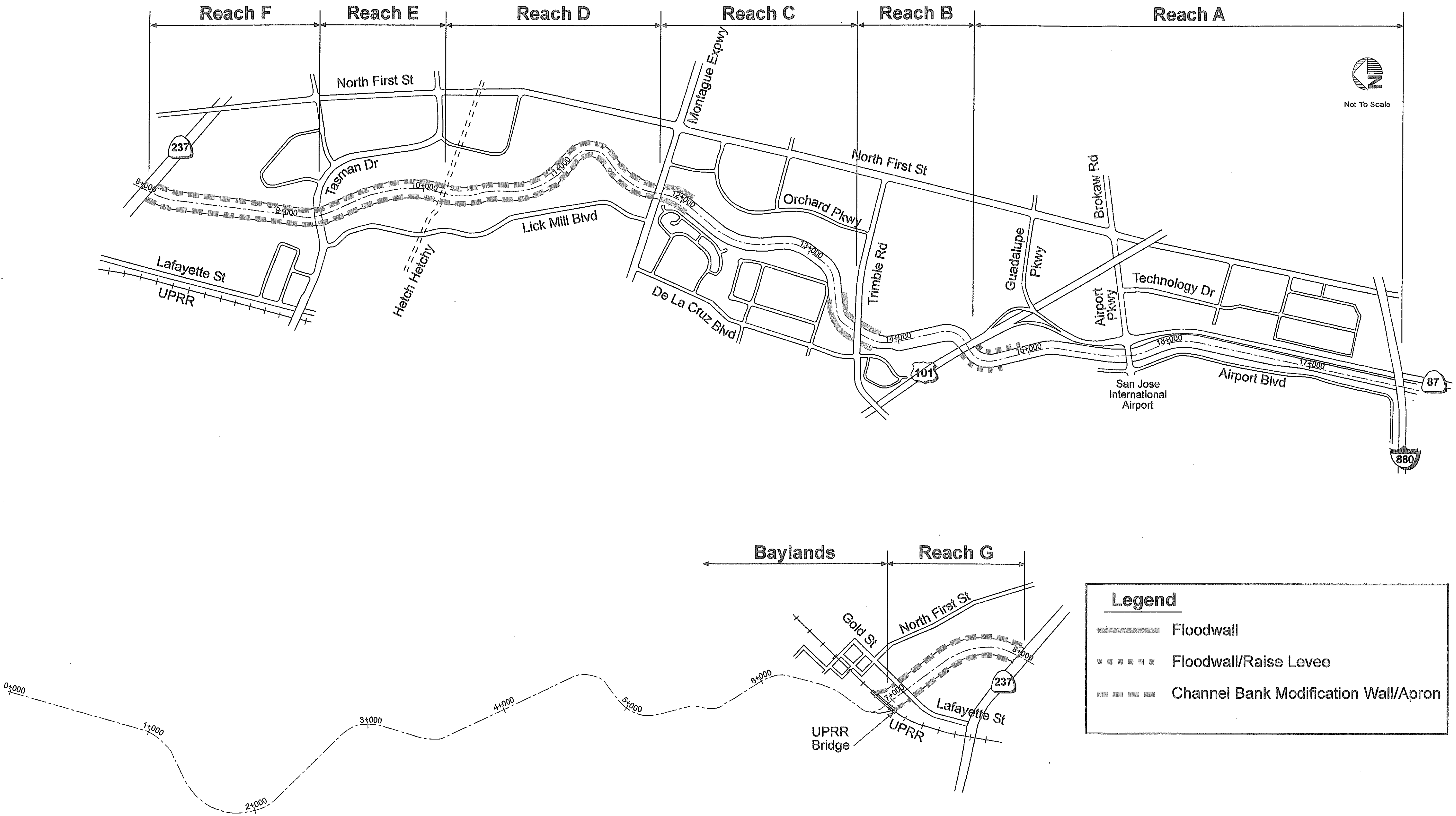
The modeling results for the 481 cms (17,000 cfs) flow condition under the Channel Bank Modification alternative indicate that significant water surface reductions will be achieved with the implementation of this alternative. The greatest reductions occur between Trimble Road and Route 237 (Reaches C through F), where the water surface elevations decrease between 1 and 1.5 m (3.2 to 4.9 ft). The greatest reductions occur in the vicinity of the Montague Expressway Bridge.

Under this alternative, there would be no overtopping of any bridge crossing on the Guadalupe River downstream from I-880. There is approximately 0.7 m (2.3 ft) surcharging on the upstream, or eastbound, Route 237 Bridge. The increased flow capacity resulting from the channel modification would provide a significant reduction in head loss through the bridge. As a result of the head loss reduction at the bridge and lower water levels achieved under this alternative, the only improvement required for this bridge to satisfy the freeboard requirements would be the construction of a floodwall at the bridge approaches.

For the 481 cms (17,000 cfs) design flow condition, existing levees satisfy the 1.07 m (3.5 ft) freeboard requirements in Reaches A, B, C, D, E, and the upstream portion of Reach F. Levee raising or a floodwall on top of the levee would be required to satisfy the freeboard requirement for Reach G and the downstream portion of Reach F. Floodwall construction would take place at the UPPR, Gold Street, upstream and downstream of Route 237, Montague Expressway, Trimble Road, Highway 101, and airport parking lot bridge approaches. Figure 4-6, on the following page, is the general plan for the Channel Bank Modification alternative.

Modification to Channel Bank by Reaches. The following channel bank modifications were identified under this alternative. The proposed improvements reduce the water surface elevation for the design flood event, provide minimum freeboard requirements, and lower the water surface elevation at I-880 to the target of 17.86 m (58.6 ft; NAVD 88).

Reach A. The project elements for this reach would include moderate levee raising or floodwall construction at the Highway 101 Bridge crossing, aggressive maintenance in the first 120 m (394 ft) downstream of I-880, and moderate vegetation management outside of the Corps' SRA mitigation areas.



153735.04.02 ChannelModAltFINAL.fh9 7/18/01(EG)

Figure 4-6
Alternative: Channel Bank Modification
General Plan
Lower Guadalupe River Project

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Reach B. The project elements for this reach would include minor levee raising at Trimble Road, sediment and vegetation removal and maintenance access road improvements. The proposed 5.5-m-wide maintenance road on the top of bank would include underpasses for Trimble Bridge. Levees will be widened to meet the 5.5-m (18 ft) criteria. Periodic selective sediment removal and moderate vegetation management would be required to maintain the design channel capacity.

Reach C. The project elements for this reach would include minor levee raising or floodwall construction at Montague Expressway, vegetation and sediment removal, and maintenance access road improvements. The existing mitigation planting area and riparian corridor would not be disturbed. Periodic selective sediment removal on the east bench and moderate vegetation management would be required to maintain the design channel capacity.

Reach D. The project elements for this reach would include the excavation of the inboard toe of the existing levees, construction of a vertical or near-vertical wall at the inside levee hinge, and construction of a sloped apron at the resulting channel bench. Preliminary hydraulic modeling indicates velocities are low enough that the channel wall and apron do not need to be a hard material (e.g., concrete, asphalt, and rock) and may be constructed of alternate materials. Hard surface channel walls and aprons would provide the lower channel roughness, increasing hydraulic capacity, which may be needed in sections. Materials appropriate for the walls would consist of concrete interlocking blocks, MSE, gabions (gravity wall constructed of stacked wire baskets filled with rocks), and crib walls. Alternate materials for the apron would be soil cement, Geoweb mats, turf-block, or ACMs. A high-strength material on the apron would be needed for the apron to serve as a maintenance access road (Figures 4-7, 4-8, and 4-9). The existing mitigation planting area and riparian corridor would not be disturbed. Maintenance roads on top of the levees would be improved to meet the 5.5-m minimum width. The work for this alternative would not likely encroach into wetland areas because work would be performed above the existing wetland edge.

Two 10.6-m wide overflow channels would be re-excavated to remove accumulated sediment in the overbanks. A 30.5- to 45.7-m-wide riparian buffer area that includes the low flow channel would be preserved. Only clearing and snagging would be allowed in the riparian buffer area. Periodic moderate vegetation management would be performed in all areas outside of the riparian buffer area.

The 1.8- and 2.3-m (72- and 90-in) Hetch Hetchy water pipelines cross the Guadalupe River at Station 10+150. The footing of the channel modification wall structure could not rest on top of the existing concrete encasement that protects the steel pipelines. Therefore, the Hetch Hetchy pipelines would be relocated as illustrated in Figure 4-10.

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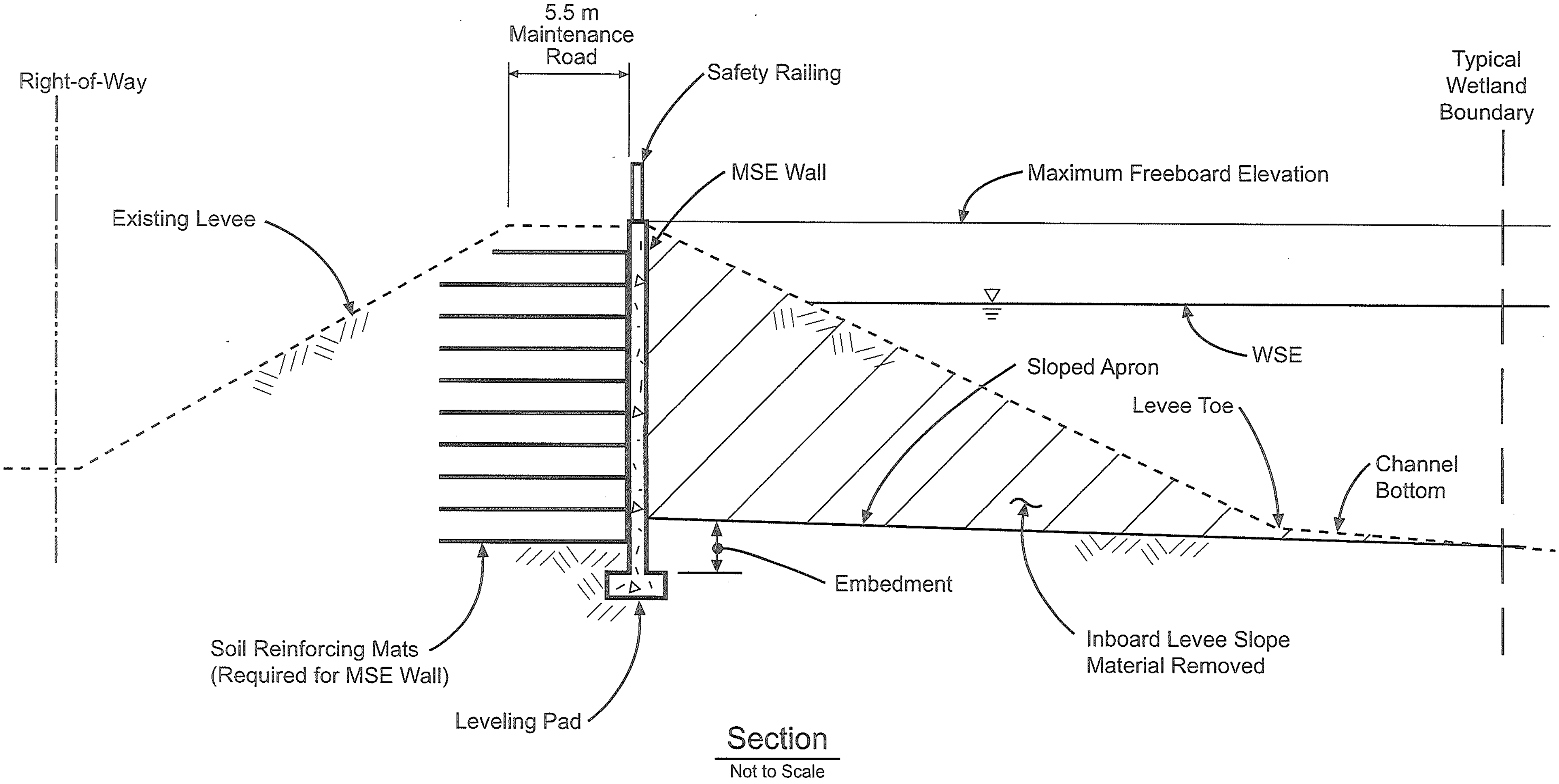

Figure 4-7
Alternative: Channel Bank Modification
Mechanically Stabilized Earth (MSE) Wall Option
Lower Guadalupe River Project

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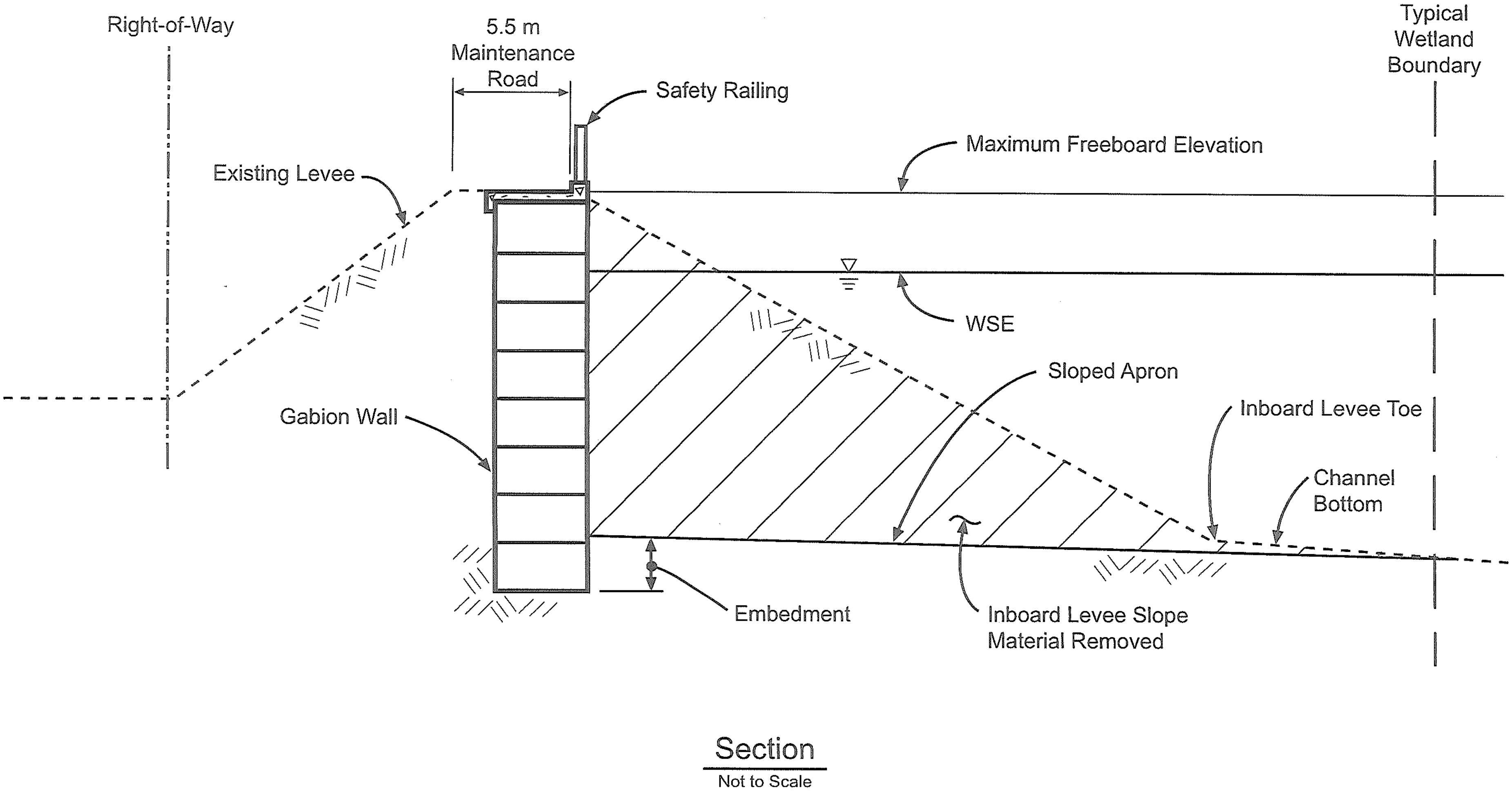

Figure 4-8
Alternative: Channel Bank Modification
Gabion Wall Option
Lower Guadalupe River Project

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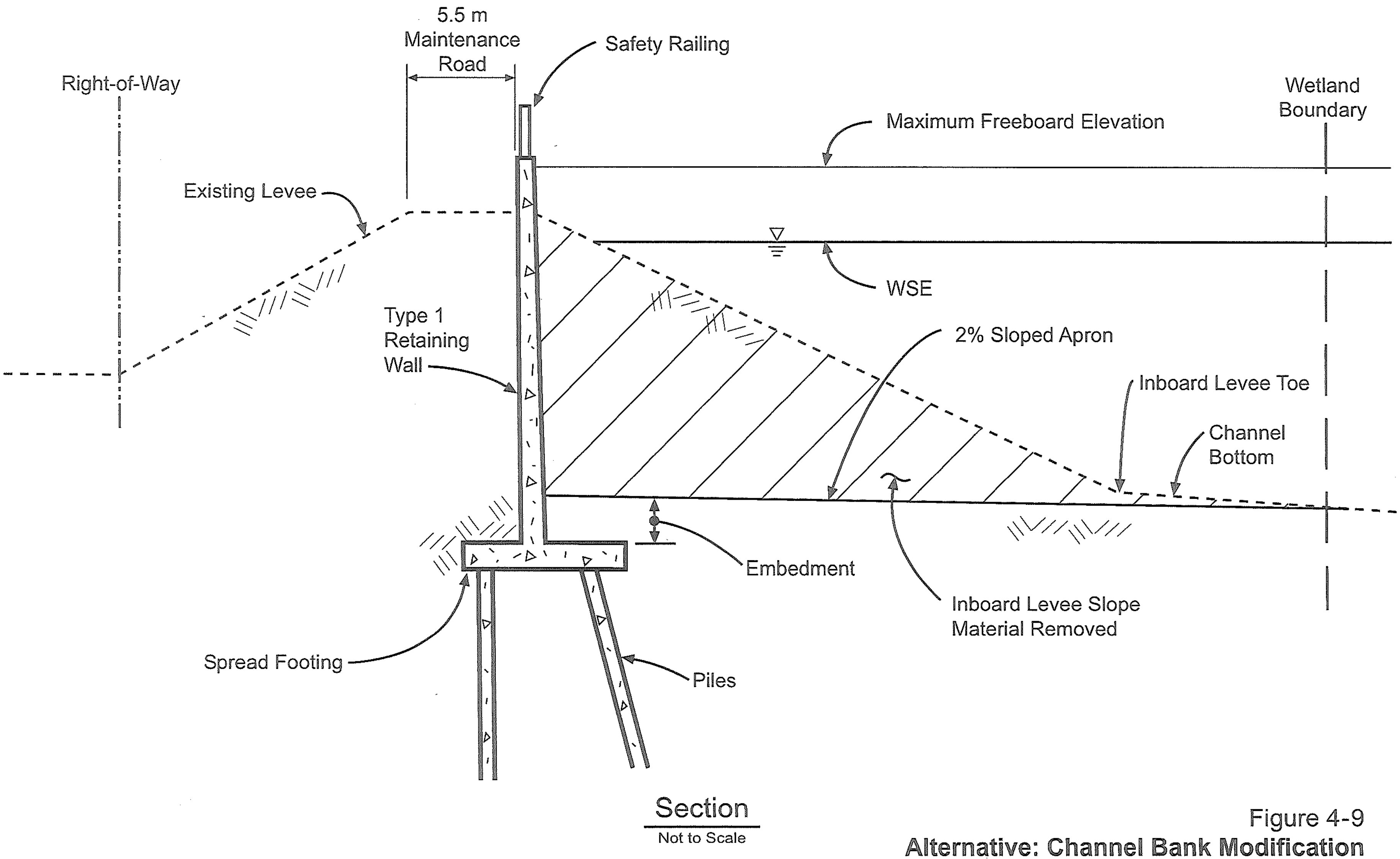

Figure 4-9

Alternative: Channel Bank Modification

Type 1 Retaining Wall Option

Lower Guadalupe River Project

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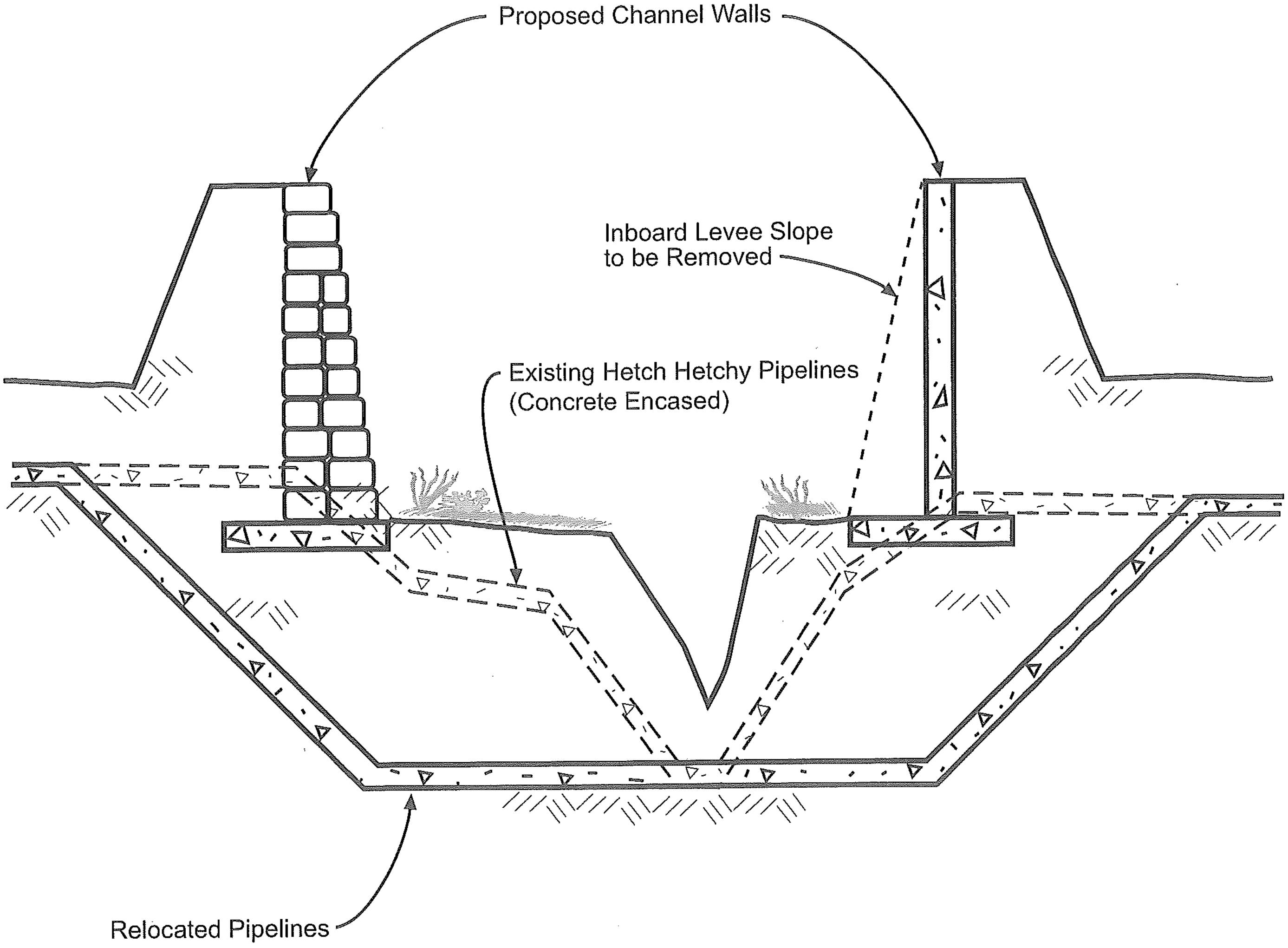
Proposed Channel Walls
Inboard Levee Slope to be Removed
Existing Hetch Hetchy Pipelines (Concrete Encased)
Relocated Pipelines

Section

Not to Scale

Figure 4-10

Alternative: Channel Bank Modification

Relocate Hetch Hetchy Pipeline

Lower Guadalupe River Project

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153735.04.01 RelocateHetchHetchyFINAL.fh9 7/18/01(EG)

Reach E. The channel modification project elements for this reach are similar to those in Reach D. The inboard slope of the levee would be removed, and a channel wall and apron would be provided. The wall would be a vertical or near-vertical surface reinforced with a hard surface such as gabions, or Type 1 retaining wall (Figures 4-7, 4-8, and 4-9). The new apron formed from the removal of the levee toe would be covered with ACM, turf block, a cellular confinement system, or soil cement. Two 10.6-m wide overflow channels would be re-excavated to remove accumulated sediment in the overbanks. A 30- to 45-m-wide riparian buffer area that would include the low flow channel would be preserved. Only clearing and snagging would be allowed in the riparian buffer area. Periodic moderate vegetation management would be performed in all areas outside of the riparian buffer area.

Reach F. The channel modification project elements for this reach are similar to those in Reach E. The inboard slope of the levee would be removed, and a channel wall and apron would be provided. The wall would be a vertical or near-vertical surface reinforced with a hard surface such as gabions, or Type 1 retaining wall (Figures 4-7, 4-8, and 4-9). The new apron formed from the removal of the levee toe would be covered with ACM, turf block, a cellular confinement system, or soil cement.

No sediment management was identified for this reach. Vegetation management in this reach would require cutting or substantially reducing, by means of herbicide treatment, the standing crop of vegetation at the beginning of each flood season.

Reach G. The channel modification project elements for this reach are similar to those in Reach F. The inboard slope of the levee would be removed, and a channel wall and apron would be provided. The wall would be a vertical or near-vertical surface reinforced with a hard surface such as gabions, or Type 1 retaining wall (Figures 4-7, 4-8, and 4-9). The new apron formed from the removal of the levee toe would be covered with ACM, turf block, a cellular confinement system, or soil cement. A 12-m section adjacent to the toe of the depressed maintenance roads would be dredged to a depth of 1 m. A 6-m buffer would remain on both sides of the low flow channel, and herbicide treatment would be used to aggressively maintain vegetation in the remaining overbank areas.

This alternative would include the relocation and modification of 37 outfalls, improvement or construction of depressed maintenance roads to pass under all bridges except Gold Street and UPRR, and construction of up to four invert stabilization structures in Reach A.

This alternative is based on the assumption that additional hydraulic capacity is provided in the channel downstream of the UPRR trestle in Alviso. The preliminary cost for this alternative is $78 million.

Floodwall/Raise Levee Alternative

The Floodwall/Raise Levee alternative would be a combination of three design concepts that would improve the channel conveyance. Either a floodwall would be constructed along the top of the existing levees, or existing levees would be raised using imported embankment material, and vegetation would be removed to an optimal maintained channel condition. Figure 4-11 presents the general plan for the Floodwall/Raise Levee alternative.

The selection between a floodwall or an embankment depends on many factors such as ROW available, the condition of the existing levee, the foundation strength of the levee and predicted settlement. The Preliminary analysis for this work was based on seven generalized cross sections of the levees to represent approximately 10 km of levee. For the final design, a detailed survey, field investigations, and geotechnical information would be necessary. Based on the generalized sections, the existing levees met the Corps criteria for stability in most cases. The difference between the computed value would be rather low, and does not allow for additional loads to be applied to the levee crest. No detailed geotechnical analysis was conducted to analyze the effect of adding a floodwall or raising the embankments more than a meter.

Providing a 5.5-m wide (18-ft-wide) levee road would be a major factor in determining which type of improvement would be the most practical for a given reach. For example, to raise the levee 1 m (0.3 ft), with 2H to 1V slopes, the crest will narrow 2 m (6.6 ft) on each side for a total reduction in width of 4 m (13.2 ft).

For areas where there is limited space for raising the levee embankment, floodwalls would be more practical. A floodwall would be placed at the inboard hinge point on top of the existing levee. However, in most cases the floodwall would be more expensive then an embankment raise.

In some areas where the settlement of the floodwall would be too great, or the ROW would be too narrow for an embankment raise, the crest could be raised using gabions or reinforced earth. Such a raise would be more flexible than a floodwall, and require less ROW than the embankment raise. However, the structures would produce greater stress on the foundation soils, which would be checked during final design.

This alternative would not require extensive levee excavation, except where the existing levee was identified as unstable per FEMA requirements and requires reconstruction. The concept centers around increasing the cross-sectional flow area of the channel by allowing the water surface in the channel to rise in elevation while being contained within the footprint of the existing channel by the floodwall or embankment. This alternative would not require modifications to the main conveyance portion of the channel with the exception of the vegetation and sediment management, as described in Chapter 6.

Where retaining walls would be constructed greater than 0.6 m (2 ft), hand rails would be provided on the top of the wall where necessary to comply with OSHA requirements. The maintenance roads on the levee tops would be widened to 5.5 m (18 ft). Ramps on both sides of the river would be provided near all bridges to allow maintenance personnel and equipment access to the main channel from the maintenance access road on top of the levees.

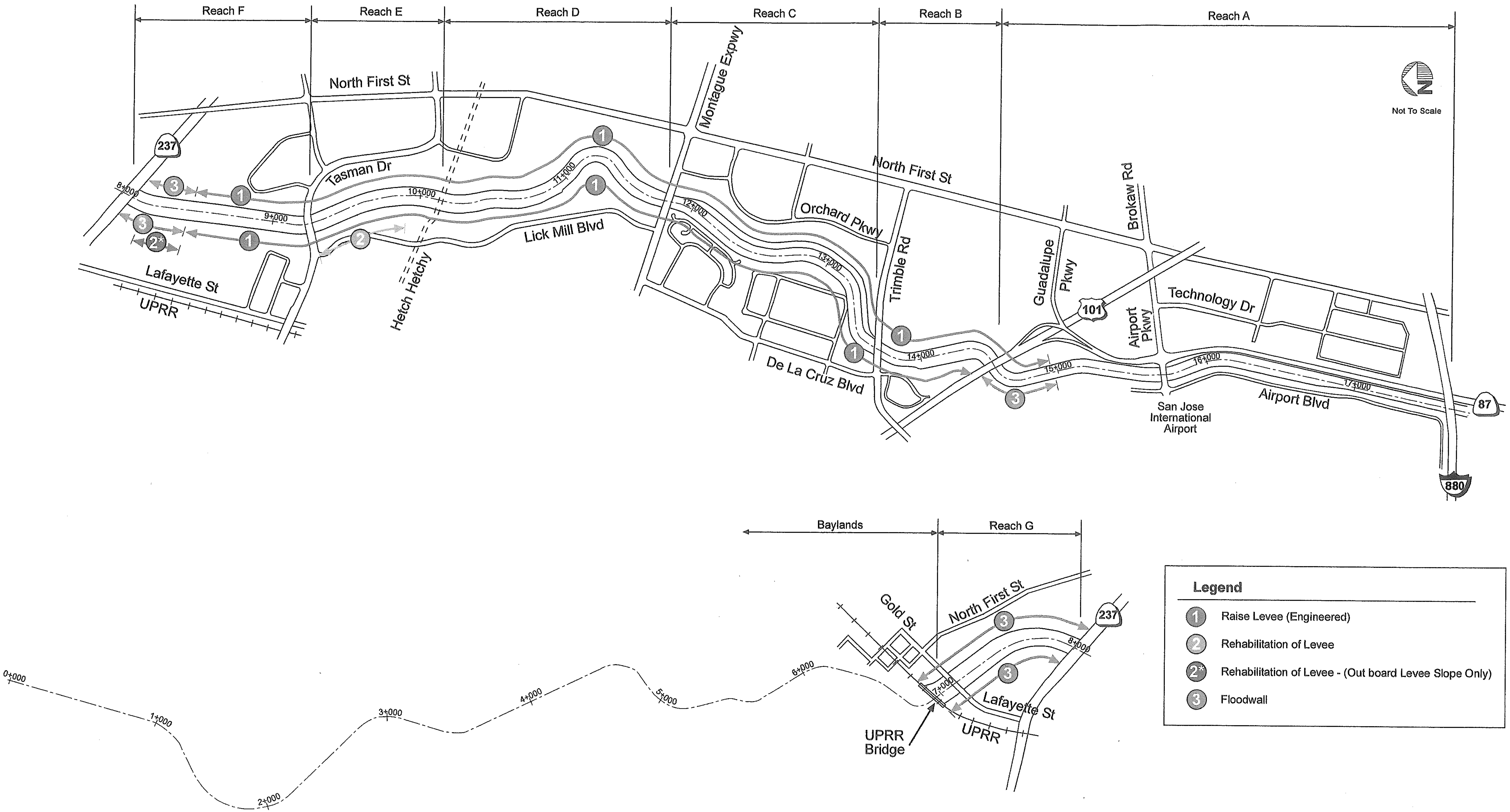


Figure 4-11
Alternative: Floodwall/Raise Levee General Plan
Lower Guadalupe River Project

153735.04.01 FloodwallLeveeAlt_2FINAL.fm9 7/18/01(EG)

Installation of floodwalls in most cases would be more expensive than elevating the levees. The advantage would be they provide the narrowest cross-sectional width and would be constructed when ROW is limited or unavailable. All retaining walls would be reinforced concrete, modified as necessary to provide for a water retaining structure, including water stops at the construction joints. Analysis for seismic loads would also be necessary. The walls would be designed to retain 1 to 2 m (3.2 to 6.6 ft) of water during the flood peak, even though part of this would be considered freeboard. Good design practice would be followed to provide a structure that would not fail during full hydrostatic loading. This would require uplift analysis as well as sliding analysis. Spread footings would likely be used throughout the project; however, the higher retaining walls may also need to be supported on piles. Figures 4-12, 4-13, and 4-14 illustrate the levee raising, outboard floodwall, and inboard floodwall, respectively. Foundation strength and settlement would be considered, and may be a controlling factor in selecting the type of raise especially where the Bay mud underlies the levees.

The Route 237 eastbound Bridge is a major constriction to flood flows. To improve hydraulic performance of the area under the bridge, and minimize improvements upstream of Route 237, the bridge would be raised to the height of the recently improved Route 237 westbound Bridge. Typically at the Gold Street, Tasman Drive, and Montague Expressway Bridges, a short transition ties adjacent levees to the bridge parapet. In addition, the access road on top of the levee would be higher than the existing city streets and a ramp (in back of the parapet) would be required to connect the two.

Under this alternative, moderate to aggressive maintenance would be required to optimize the hydraulic capacity of the channel, which would include vegetation and sediment management. The proposed maintenance activities are described in Chapter 6 in this report.

Hydraulic Analysis. The modeling results for the 481 cms (17,000 cfs) flow condition for the Floodwall/Raise Levee alternative indicate that the required flood protection would be achieved with the required freeboard. The greatest benefit over the existing conditions occurs between Trimble Road and Route 237 (Reaches C through F), where the water surface elevations decrease between 0.7 and 1.2 m (2.3 to 3.9 ft). The greatest reductions in water surface occur in the vicinity of the Montague Expressway Bridge as a result of sediment and vegetation removal.

Under this alternative, no overtopping of any bridge crossing the Guadalupe River downstream from I-880 occurs. However, to meet freeboard at the upstream, or eastbound Route 237 Bridge, the hydraulic modeling included improvements to the existing bridge structure. The bridge deck elevations and pier configuration of the eastbound Route 237 Bridge were adjusted to match the westbound Route 237 Bridge. As a result, conveyance under the bridge was increased because of narrower pier widths and a raised bridge deck. There would be approximately 0.3 m (1 ft) of surcharging on the Montague Expressway Bridge. However, the required freeboard met.

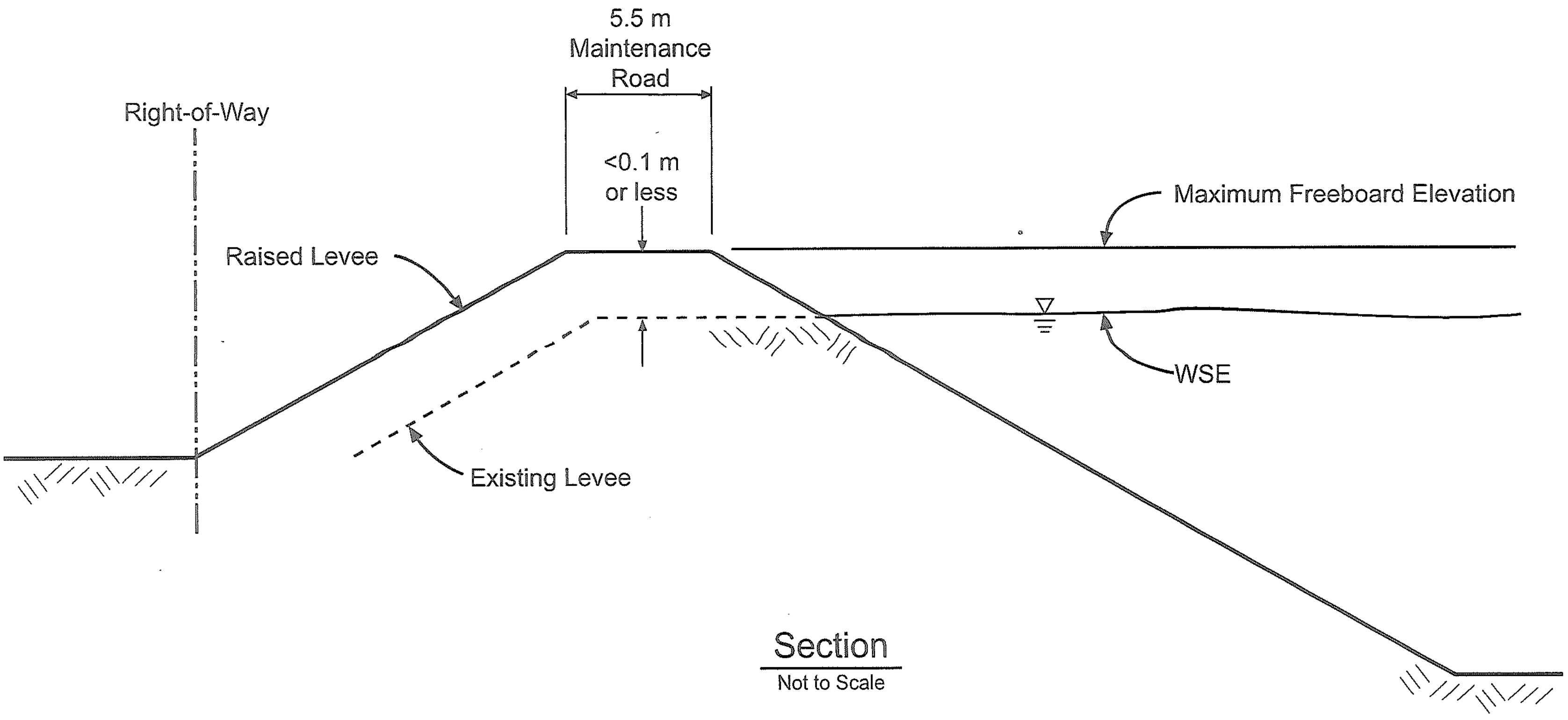


Figure 4-12

Alternative: Floodwall/Raise Levee

Raise Levee

Lower Guadalupe River Project

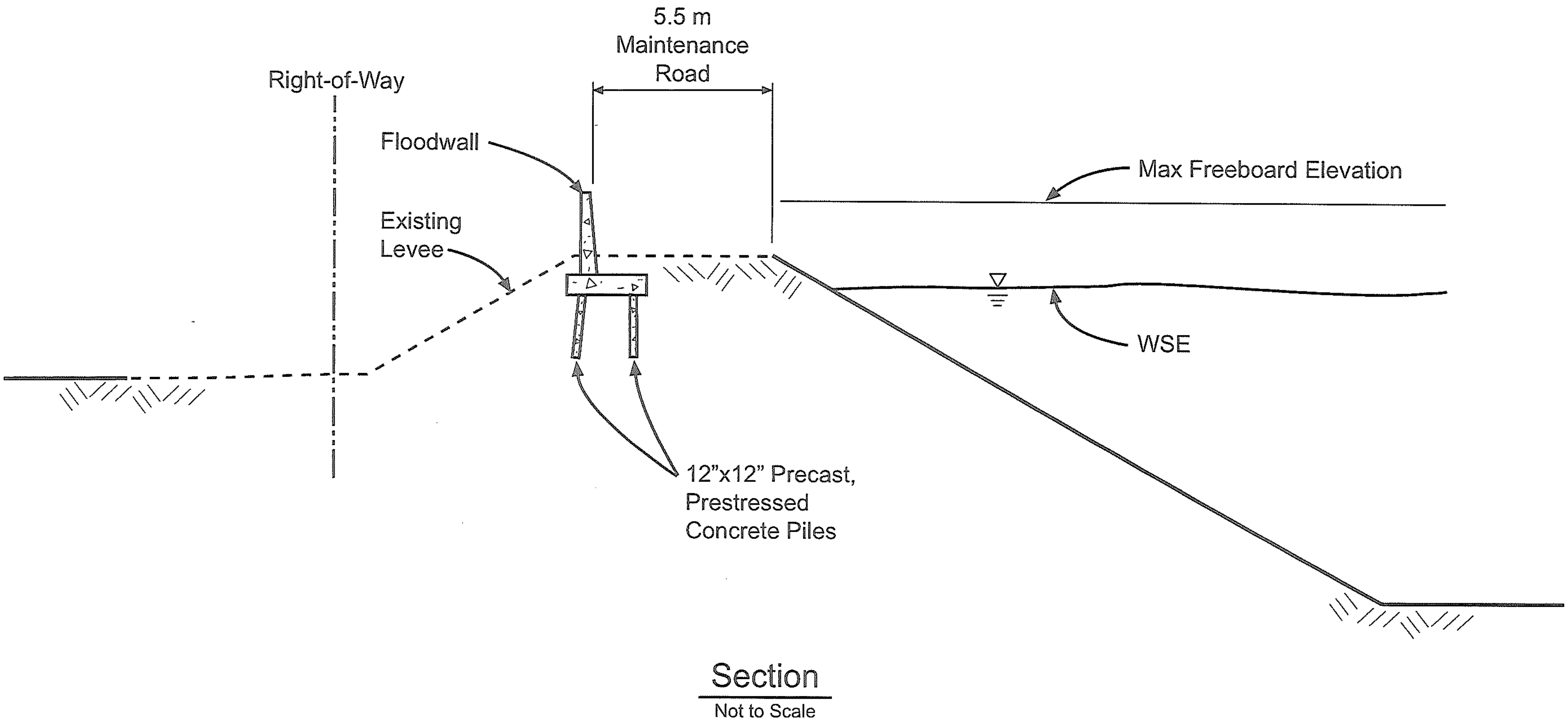
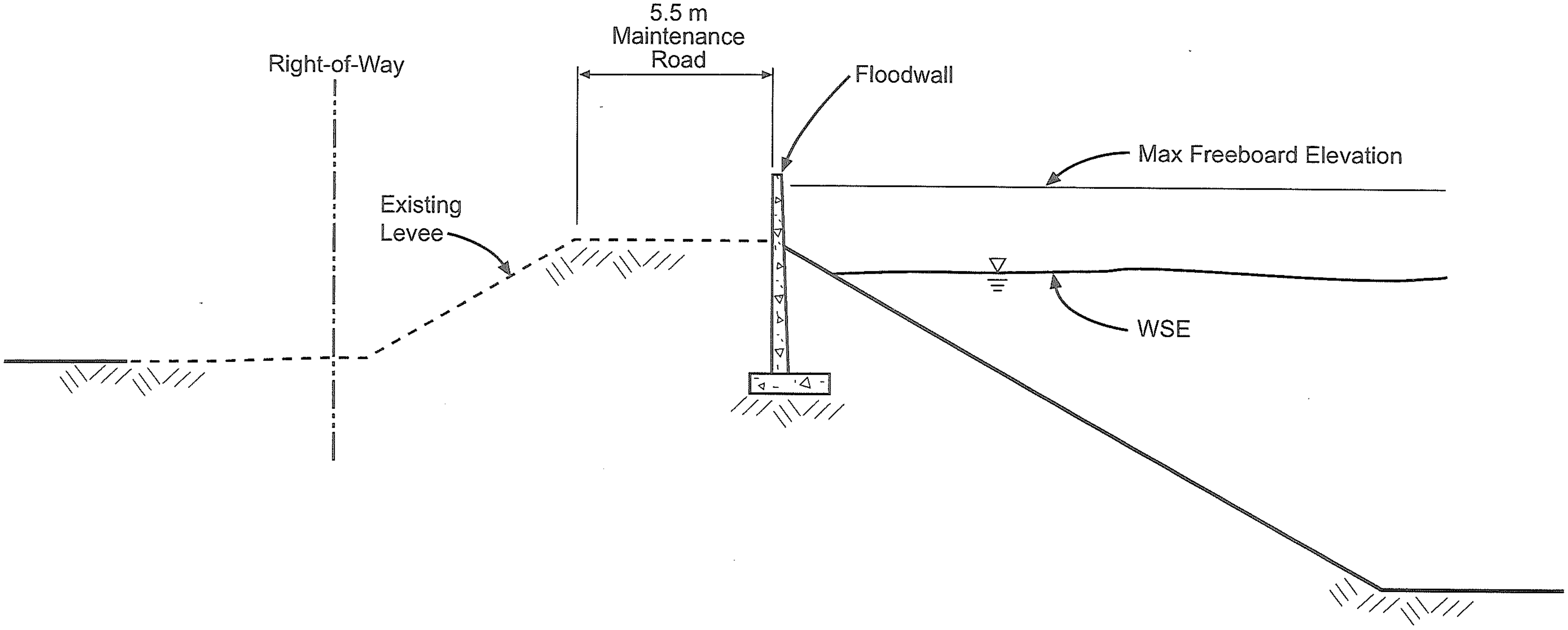


Figure 4-13
Alternative: Floodwall/Raise Levee
Outboard Floodwall
Lower Guadalupe River Project



Section

Not to Scale

Figure 4-14

Alternative: Floodwall/Raise Levee

Inboard Floodwall

Lower Guadalupe River Project

For the design flow, the existing levees that line the Guadalupe River in Reaches A, B, and the upstream portion of Reach C approaches the 1.07 m (3.5 ft) freeboard requirement. Minor levee raising would be required to satisfy the freeboard requirement for Reaches B and C. Moderate levee raising would be required in Reaches D, E, and the upstream portion of F. Floodwall construction would be constructed to satisfy the freeboard requirement for the downstream portion of Reach F and all of Reach G. Floodwall construction would be needed at the UPRR, Gold Street, upstream and downstream of Route 237, Montague Expressway, Trimble Road, Highway 101, and airport parking lot bridge approaches.

Manning's *n* roughness values used in the hydraulic analysis corresponded to the vegetation management and sedimentation prevention program detailed in Chapter 6. The *n* values used for the main channel vary from 0.027 to 0.037 throughout the study area. The *n* values used outside of the main channel were based on the optimal, or a recently maintained, vegetation (cut to 0.3 m [1 ft] high) and sedimentation (fully excavated) management condition.

To maintain the upstream boundary water surface elevation of 17.86 m (58.6 ft; NAVD 88) at the I-880 Bridge, aggressive vegetation management would be required for 120 m (393 ft) downstream from the bridge. This resulted in a decreased *n* value of 0.03 for the entire channel in contrast to the previous values of 0.037 for the main channel and 0.04 for the overbanks. No buffer zone would be provided adjacent to the main channel for this aggressively maintained reach.

This alternative is based on the assumption that additional hydraulic capacity would be provided in the channel downstream of the UPRR trestle in Alviso.

Modification to Channel by Reaches

Two 10.6-m-wide overflow channels would be re-excavated to remove accumulated sediment in the overbanks. A 30.5- to 45.7-m-wide riparian buffer area, that would include the low flow channel, would be preserved. Only clearing and snagging would be allowed in the riparian buffer area. Periodic moderate vegetation management would be performed in all areas outside of the riparian buffer area.

Reach E. The project elements for this reach would include levee raising, vegetation and sediment removal, and maintenance access road improvements. Although sediment and vegetation removal improve the conveyance in this channel and lower the water surface elevation, levee raising would be required to meet freeboard requirements. The most appropriate means for raising the levees in this reach would be by conventional methods. The existing mitigation planting area and riparian corridor would not be disturbed. Maintenance roads on top of the levees would be improved to meet the 5.5-m minimum width.

Preliminary geotechnical evaluations indicate that the east levee from Stations 9+275 to 10+050 approximately, would require complete rehabilitation.

Two 10.6-m-wide overflow channels would be re-excavated to remove accumulated sediment in the overbanks. A 30- to 45-m-wide riparian buffer area that includes the low flow channel would be preserved. Only clearing and snagging would be allowed in the riparian buffer area. Periodic moderate vegetation management would be performed in all areas outside of the riparian buffer area.

Reach F. The project elements for Reach F would include the Route 237 eastbound Bridge replacement option, floodwall construction on top of the inboard hinge of the levee, from the Route 237 Bridge crossing to Station 8+500, levee raising from Stations 8+500 to 9+225 on the east and west levee, and the complete rehabilitation of the west levee from Stations 8+200 to 8+600.

Floodwall construction is the appropriate means of providing freeboard in the first 600 m (1,969 ft) of Reach F to avoid encroachment into ROW and two drainage canals adjacent to the outboard toe of the east and west levees. The encroachment into the canals located on the outboard side of these levees would result from raising the levees with 2H to 1V side slopes. The east drainage canal is located within Stations 8+100 to 8+600. The west drainage canal is located within Stations 8+100 to 8+600.

No sediment management was identified for this reach. Vegetation management in this reach would require cutting or substantially reducing, by means of herbicide treatment, the standing crop of vegetation at the beginning of each flood season.

Reach G. The project elements for this reach would include floodwall construction, vegetation and sediment removal, and maintenance access road improvements including new construction of depressed maintenance roads. The computed hydraulic performance of this reach would be highly dependent on the aggressive removal of vegetation. Although sediment and vegetation removal would improve the conveyance in this channel and lower the water surface elevation, floodwall construction would be required to meet freeboard criteria. The water surface elevation plus freeboard would be expected to rise above the top of levees as much as 1.25 m. Because of the lack of ROW that would be needed to raise the levees and to avoid wetland encroachment, floodwall construction would be the appropriate option to protect the surrounding areas from the design flood event. Drainage canals located adjacent to the outboard toe of the east and west levees would prevent the relocation of the outboard levee toe that would result from raising the levee height. Floodwalls would be located on the inboard levee hinge.

A 12-m (36 ft) section adjacent to the toe of the depressed maintenance roads would be dredged. A 6-m (18 ft) buffer will remain on both sides of the low flow channel, and herbicide treatment would be used to aggressively maintain vegetation in the remaining overbank areas.

Under this alternative, the upstream Route 237 Bridge (eastbound traffic) would be replaced and raised to match the soffit elevation of the downstream Route 237 Bridge (westbound traffic). The pier configuration of the upstream bridge would match the pier configuration of the downstream bridge.

Route 237 Eastbound Bridge. There were two options developed to satisfy the capacity requirements of the Lower Guadalupe River at the Route 237 eastbound Bridge. A brief evaluation was conducted to determine the feasibility of the two alternatives. A preliminary construction cost estimate was developed for each alternative.

Route 237 consists of two parallel bridges over the Lower Guadalupe River, which separate east and westbound traffic. The westbound bridge is approximately 1.5 m (4.92 ft) higher than the eastbound bridge. The west abutment for both bridges begins at the same location, but the westbound bridge extends approximately 140 m (450 ft) to the east beyond the end of the eastbound bridge.

The bridge replacement option would remove and replace the eastbound bridge and raise the profile to match the westbound bridge and profile. The bridge bypass culvert option would be to construct a culvert to the east of the existing bridge to provide additional capacity requirements. The culvert would be a six-barrel, cast-in-place, concrete box culvert. The walls of the culvert would align with the existing pier supports for the westbound bridge to maximize capacity through the bypass area.

The bridge bypass culvert concept was not recommended because it would (1) require a high level of difficult maintenance, thereby incurring higher annual and maintenance costs; (2) would not provide for continuous maintenance access; and (3) would not complement the County trail master plan.

A construction staging plan for the Route 237 Bridge replacement is included in Appendix F, Engineering Drawings of Proposed Project. The preliminary cost for this alternative is $60.58 million.

Channel Bypass Alternative

The Channel Bypass Alternative was conceived for the ultimate protection of the wetland and upland habitat inhabiting the existing low flow channel and benches throughout the LGRP area. This alternative would include constructing a bypass conduit that would convey flood flows from Highway 101 to just downstream of the Gold Street Bridge within the west levee. A second bypass culvert from Montague Expressway to UPRR would be built within the east levee.

Figure 4-15 shows a general location of the culverts. The bypass culverts would be closed and generally hidden within the levee footprint. Because of the required width dimensions, a portion of the culvert would extend beyond the embankment prism on the channel side of the levee. A concrete apron would be constructed at the downstream end of each bypass to reduce scour potential at the outlet. Both culverts would have interior measurements of 8.5 m wide by 5 m high (27.9 ft wide by 16.4 ft high) from Montague Expressway to Gold Street Bridge. The west culvert from upstream of Highway 101 to Montague Expressway Bridge would have interior dimensions of 8.5 m wide by 3.5 m high (27.9 ft wide by 11.5 ft high).

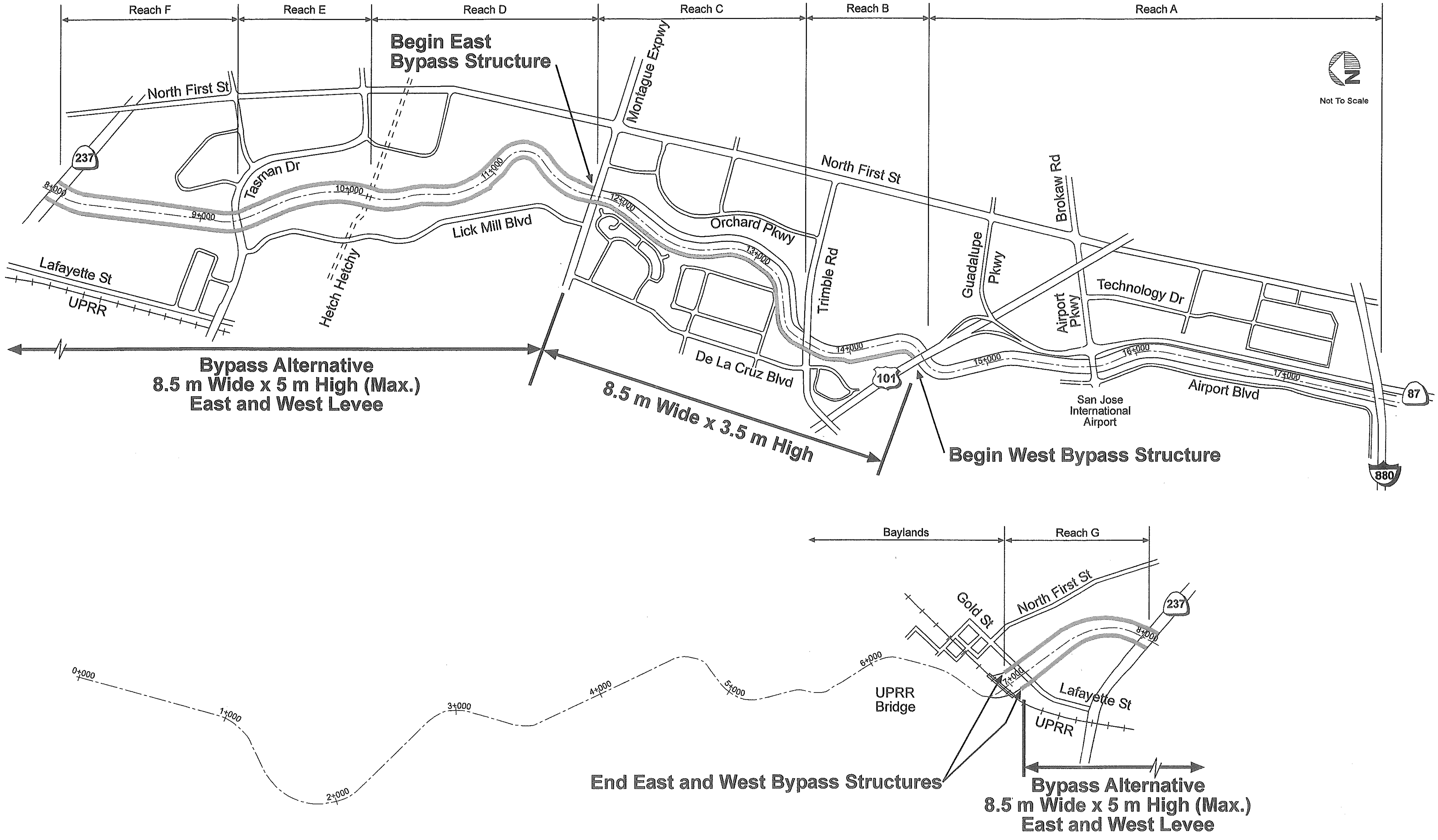


Figure 4-15
Alternative: Channel Bypass
Bypass Culvert General Plan
Lower Guadalupe River Project

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The top of the culverts would be designed to receive direct traffic from District maintenance vehicles (Figures 4-16 and 4-17). More specifically, the west culvert would be approximately 7.5 km (4.56 mi) long, and begin upstream of the crossing of Highway 101 and end downstream of Gold Street in Alviso. The second culvert proposed for the east levee would begin downstream of the Montague Street Bridge and end downstream of Gold Street. The length of this structure would be approximately 4.7 km (2.92 mi). Each culvert would have one inlet and outlet. The inlet would be located at the most upstream position of each.

Two potential major constraints were identified for this alternative. They are presented below:

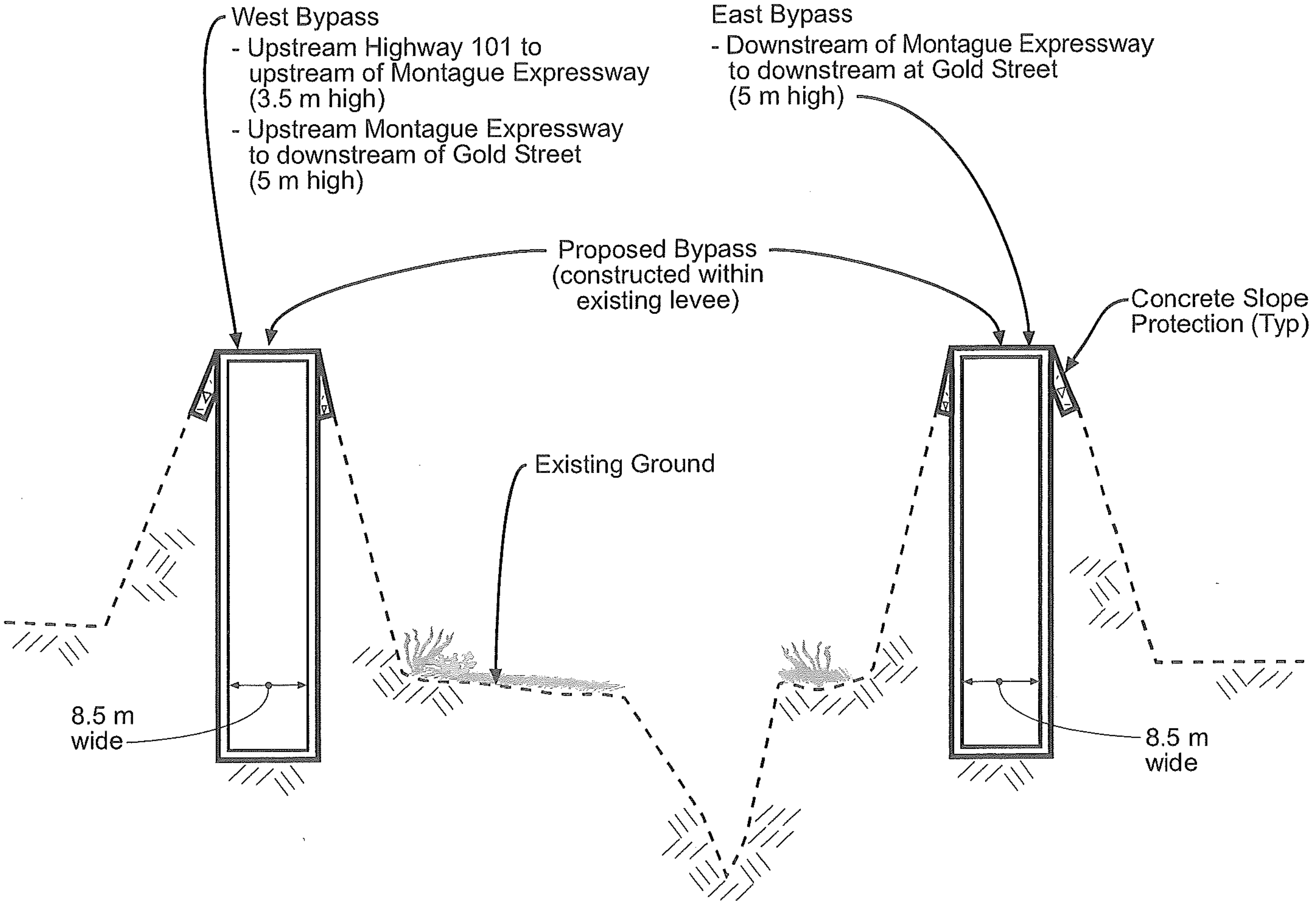
- Constructing the bypass at the numerous bridges would potentially require property acquisitions at some of the bridges.
- The required alignment of each bypass would interfere with and require relocation of existing utilities including the Hetch Hetchy pipeline.

Hydraulic Analysis. The flow would enter the bypass at weir intakes located at Highway 101 (Station 14610) and the Montague Expressway (Station 11760). The culverts would operate under "open channel" condition for the project design discharge. The analysis performed assumed that the bypass system would be designed to carry all the flows in excess of the river's existing capacity. The intakes for each culvert would be designed to accept 89 cms (31.50 cfs) under free-surface flow conditions. Freeboard, measured to the soffit of the bypass, is included in the amount of 1 m (3 ft) freeboard on the levees and 1.2 m (4 ft) freeboard at the bridge approaches.

Modification to Channel by Reaches

The preliminary design of the bypass was investigated, and two alternatives were proposed for the foundation of this structure. The first was precast, prestressed concrete piles, and the second was a spread footing. The piles were found to be less expensive and perhaps a better design when considering the potential for levee settlement along the project reach in the future, specifically in the portion of the west levee that lies between 500 m upstream and 500 m downstream of Montague Expressway Bridge crossing.

Because the goal of constructing these bypass structures would be to protect the existing vegetation and habitat currently existing in the channel to the maximum extent possible, excavation would occur through the center of the existing levee for placement of the precast, prestressed box culvert. A typical section of this structure is shown in Figure 4-17. The top of the box itself would be designed to the same elevation as the existing levees and no more than necessary of the existing levee would be disturbed. However, the design for stable earthen surfaces up against the new bypass would require significant grading and compaction and little of the existing levee vegetation would remain. The top 1.6 m (5.3 ft) of the levee on either side of the box would have concrete slope protection. Additional MSE reinforcement would be proposed for another 3 to 5 m (9.8 to 16.4 ft) beyond the concrete.


West Bypass
- Upstream Highway 101 to upstream of Montague Expressway (3.5 m high)
- Upstream Montague Expressway to downstream of Gold Street (5 m high)
East Bypass
- Downstream of Montague Expressway to downstream at Gold Street (5 m high)
Proposed Bypass (constructed within existing levee)
Concrete Slope Protection (Typ)
Existing Ground
8.5 m wide
8.5 m wide

Section

(Looking Downstream)

Not to Scale

Figure 4-16

Alternative: Bypass Culvert

Typical Cross Section

Lower Guadalupe River Project

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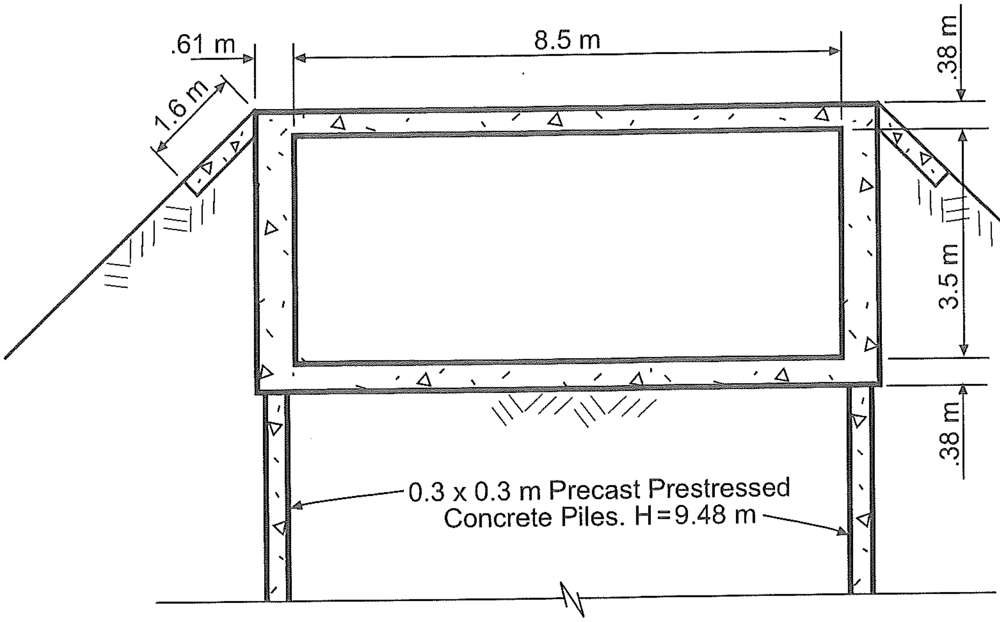
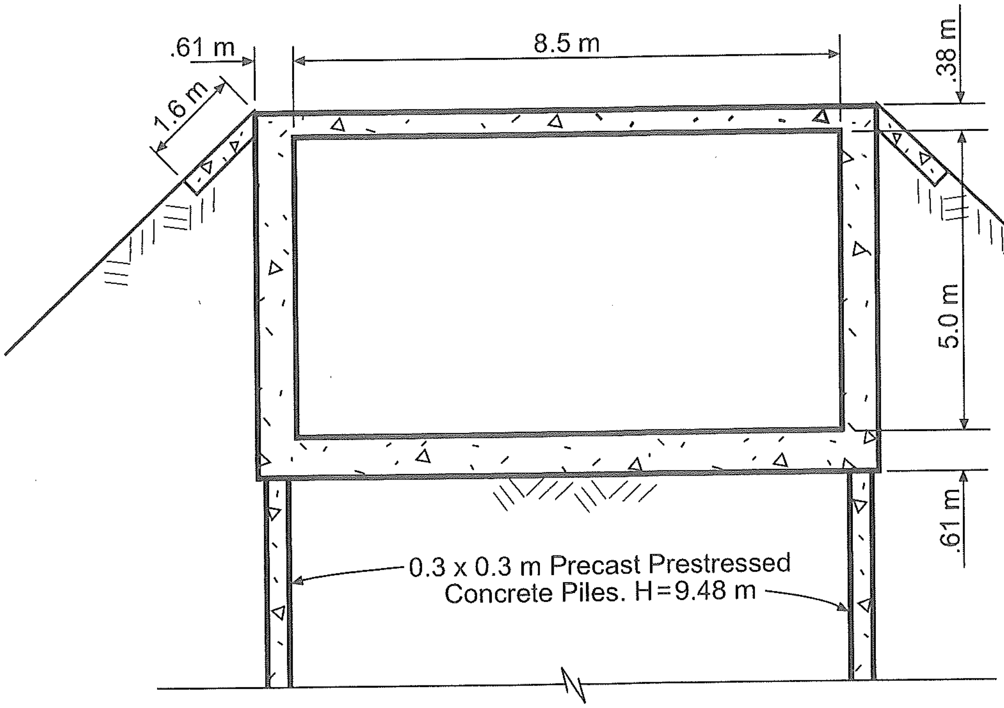


Section

Scale: 1:400



Section

Scale: 1:400

Figure 4-17

Alternative: Bypass Culvert

Preliminary Bypass Cross Sections

Lower Guadalupe River Project

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Reach A. The project elements for this reach would include moderate levee raising or floodwall construction at the Highway 101 Bridge crossing, aggressive maintenance in the first 120 m (394 ft) downstream of I-880, and moderate vegetation management outside of the SRA mitigation areas.

Reaches B and C. The centerline of the box was determined based on the centerline of the existing levees. Near the bridge abutments, a 10-m (33-ft) horizontal separation between the edge of the box and face of the abutment is assumed. This distance represents a one to one ratio of approximate height of the abutment to clear unobstructed distance. When the edge of the box encroaches within this distance as it would for the proposed widened Trimble Road Bridge, a realignment of the box would be necessary.

Figure 4-18 shows a conceptual realignment of the left culvert at the Trimble Road abutment. Because of the proximity of two existing buildings, the realignment would not be effected without encroaching on the recommended 10-m (33-ft) measurement. On either side of the bridge abutment special construction procedures would be necessary for the protection of the abutment. However, a majority of the realigned structure would clear 10 m (33-ft).

In those cases where the alignment of the box would approach existing structures, special provisions would be required during construction. Figure 4-18 also shows that the existing building located downstream of the Trimble Bridge abutment is very close to the ROW line. The bypass structure is likewise very close to the ROW line and would require sheetpile protection of the building and excavated trench for the full length of the building. In addition to the special construction, the property corners of each of the two adjacent lots would be encroached by the bypass. The actual amount of property needed would be determined during final design when the alignment and dimensions would be better defined.

The top elevation of each adjacent levee would be made equal throughout the project. This may be accomplished differently for each levee. For example, in instances where the height of the levee would be increased as a result of the required culvert soffit elevation, the existing levee crown elevation on the adjacent levee would be raised to the same elevation.

Vegetation and sediment management would be the same as described for the Floodwall/Raise Levee and Channel Modification Alternatives.

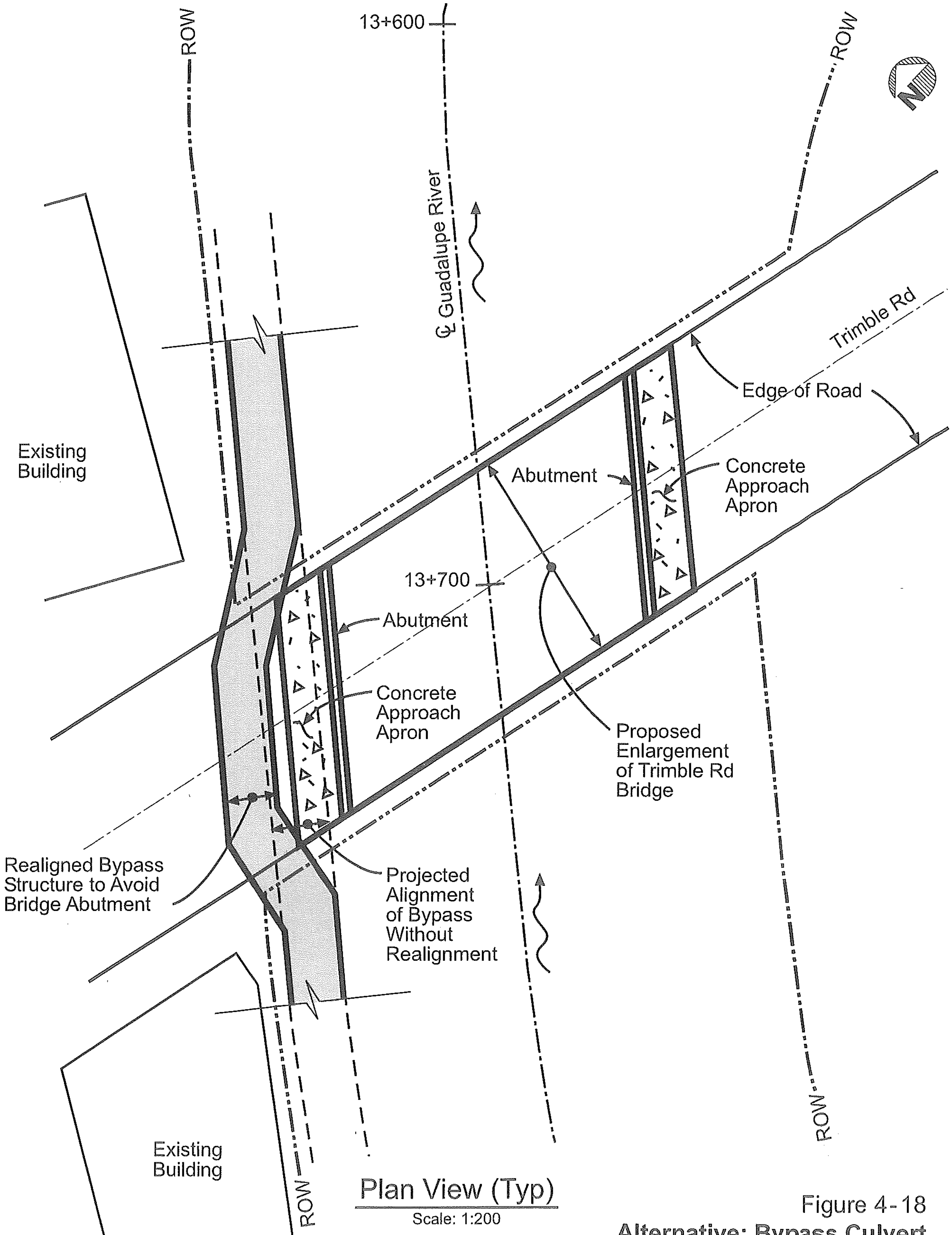

Figure 4-18
Alternative: Bypass Culvert
Bypass Realignment at Bridge Abutment
Trimble Road Bridge-West Abutment
Lower Guadalupe River Project

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Reaches D through G. The centerline of the box was determined based on the centerline of the existing levees. Figure 4-19 shows the realignment necessary for the two Hetch Hetchy pipelines. The Hetch Hetchy pipelines consist of 1.83-m (72-in) diameter and 2.29-m (90-in) diameter pipes that provide water for San Francisco. Figure 4-19 illustrates the bypass culverts that would intersect the pipes. Because this would not be acceptable, the following two options were considered: extend the adjustment of the pipes under the alignment of the bypass culverts or adjust the bypass under the pipes. The latter solution provides several unacceptable situations. First a siphon would be created that could collect sediment, and a pressure flow condition within the bypass would most likely occur. A pressure flow condition in the bypass is an unacceptable design criteria; therefore, the preferred option would be to relocate the Hetch Hetchy pipelines as shown. Vegetation and sediment management would be the same as described for the Floodwall/Raise Levee and Channel Modification Alternatives.

The construction of the bypass element at Route 237 under the Floodwall/Raise Levee alternative contains a discussion on methods of construction for that structure. The construction for full channel bypass would require similar construction methods at each bridge crossing the river.

The new levee would be somewhat wider along a majority of the channel to accommodate the 9.7 m (31.82 ft) outside width of the bypass structure. Assuming the same elevation of the top of the existing levee, the full width of the new levee would not be wider than the existing levee. If the levee ROW is determined to be inadequate during final design, two approaches could solve any potential conflict. If the adjacent property is developed, then a small retaining wall could be added to confine the new levee. If the property is undeveloped or has sufficient open space and the property owner is willing to grant a small fill easement, then the new levee could extend as necessary into the adjacent property.

Because this alternative is based on the protection of the existing channel vegetation, no staging areas would be permitted within the confines of the existing channel. Additional staging areas required for contractor's operations would be met by properties within an acceptable distance from the project. The access ramps for channel maintenance would be provided for this alternative in the same locations that exist for the No-Project alternative.

Each bypass would require periodic cleaning of fine silts that would continuously settle in the structure. The coarse gravel would not enter the culvert because of the configuration of the inlet structures. The inlet structure would be a side or parallel weir set above the elevation of the main channel, with sufficient length to convey the design storm. This would convey base flow into the main channel of the river and have the secondary effect of only passing finer sediments into the bypass. Access port holes would be provided along the top of the bypass at specified intervals. The ports would be large enough to accommodate lowering a small Bobcat™ type equipment into the culvert for maintenance operations. Access would be provided at the inlets and discharge locations of each structure. This alternative is based on the assumption that additional capacity would be provided in the channel downstream of the UPRR Bridge in Alviso.

The preliminary cost estimate for this alternative is approximately $200 million.

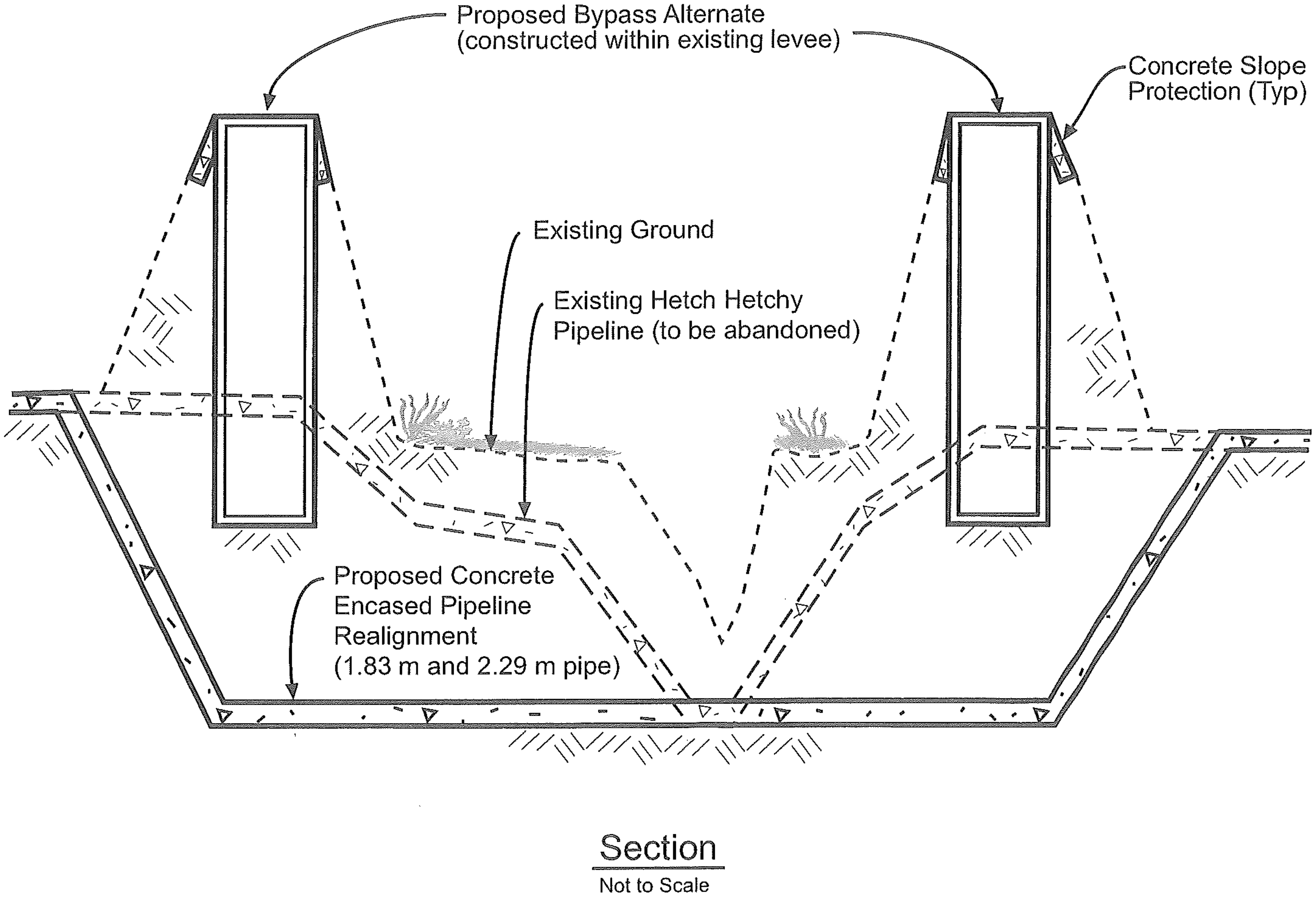
Proposed Bypass Alternate
(constructed within existing levee)
Concrete Slope Protection (Typ)
Existing Ground
Existing Hetch Hetchy Pipeline (to be abandoned)
Proposed Concrete Encased Pipeline Realignment
(1.83 m and 2.29 m pipe)
Section
Not to Scale

Figure 4-19
Alternative: Bypass Culvert
Realignment of 1.83 m and 2.29 m Hetch Hetchy Pipeline
Lower Guadalupe River Project

4.7.3 Project Selection

The Floodwall/Raise Levee alternative will provide the desired flood protection (including freeboard) from the design event. It was determined in the EIR that the Floodwall/Raise Levee alternative is the environmentally superior alternative. Slightly fewer impacts on biological resources and cultural resources were found with this alternative, because floodwalls would be constructed on existing levees, and levee raising would occur in a way as to avoid sensitive wildlife habitat, wetlands, or known cultural resources. The construction needed for floodwalls and raising levees would generally be simpler than the construction necessary to excavate levees and build MSE or concrete walls in the channel, or the massive levee excavation that would occur with the Bypass alternative. The exception would be the construction of the bridge under-crossings and the reconstruction of the Route 237 eastbound Bridge, which would require a high level of construction activity with some associated traffic delays. However, four traffic lanes would remain open during construction. This alternative is considered to be the most feasible and practicable because it provides the design flood protection, preserves wetlands and riparian habitat, meets a reasonable schedule, provides continuous maintenance access, meets FEMA requirements, and improves flood protection for Alviso.

Table 4-4, on the following pages, presents a comparative summary of alternatives for the LGRP.

Table 4-4
Comparative Summary of Alternatives for the Lower Guadalupe River Project

Issues of Concern	Channel Modification	Floodwall/Raise Levee	Bypass
1. Project Cost[1]	$78 million	$60.58 million	$200 million
2. Physical Environment			
A. General Description	Excavation of the inboard toe of the existing levees, construction of a vertical or near-vertical wall at the inside levee point, and construction of a sloped apron at the resulting channel bench, from UPRR to Montague Expressway. Materials for the walls would be reinforced concrete interlocking blocks, reinforced concrete, gabions (gravity wall constructed of stacked wire baskets filled with rocks), or crib walls. Alternate materials for the apron would be geoweb mats, turf-block, or articulated concrete mattresses (ACM). Floodwall or levee raising would be required at Montague Expressway, Trimble Road, and Highway 101 Bridges.	Construction of a concrete floodwall on top of the levees from UPRR to 600 m upstream of Route 237 Bridge. Levee raising of the east and west levee from 600 m upstream of Route 237 Bridge to Highway 101 Bridges. Sediment and vegetation would be removed to an optimal maintained channel condition. Eastbound Route 237 Bridge would be reconstructed to match soffit elevation of existing westbound bridge.	Construction of a box culvert inside existing east and west bank levees. The culverts would be approximately 8.5 m (28 ft) wide by 5 m (16.5 ft) high. The bypass structures would extend on the west levee from immediately downstream of the Highway 101 Bridge, and on the east levee from immediately upstream of Montague Expressway, to a location immediately upstream of the UPRR Bridge.
B. Erosion	Would not result in a significant adverse impact on channel erosion.	Would not result in a significant adverse impact on channel erosion.	Bypass inlets and outlets would require additional erosion protection.
C. Sedimentation	Would not result in significant deposition.	Would not result in significant deposition.	Would not result in significant deposition.

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[1] Includes construction, engineering, design, ROW, and environmental mitigation.

Issues of Concern	Channel Modification	Floodwall/Raise Levee	Bypass
D. Water Quality	Construction-related effects on water quality would be less than significant.	Construction-related water quality effects are considered less than significant.	Construction related water quality effects are considered less than significant.
E. Maintenance	Routine channel maintenance of sediment and vegetation, removal of woody debris, and bank stabilization would be required to preserve the as-built design capacity.	Routine channel maintenance of sediment and vegetation, and removal of woody debris and bank stabilization would be required to preserve the as-built design capacity.	The bypass would require periodic cleaning because fine silts would deposit into the structure. The coarse gravels will not enter the culvert because of the configuration of the inlet structures. Routine channel maintenance of sediment and vegetation, and removal of woody debris and bank stabilization would be required to preserve the as-built design capacity.
3. Biological Environment	Loss of riparian and wetland habitat from levee construction and in-channel vegetation and sediment management would have significant impacts on vegetation in the LGRP channel. Replacing or compensating for habitat loss would be required.	Loss of riparian and wetland habitat from levee construction and in-channel vegetation and sediment management would have significant impacts on vegetation in the LGRP channel. Replacing or compensating for habitat loss would be required.	Loss of riparian and wetland habitat from levee construction and in-channel vegetation and sediment management would have significant impacts on vegetation in the LGRP channel. Replacing or compensating for habitat loss would be required.
A. Fish Habitat	Impacts caused by construction would be less than significant. Impacts caused by sediment management would be mitigated.	Impacts caused by construction would be less than significant. Impacts caused by sediment management would be mitigated.	Construction impacts at inlet weirs would need to be mitigated by ensuring that culvert design does not result in barriers to fish passage or stranding of fish.
B. Wildlife Habitat	Impacts on wildlife associated with riparian and wetland habitat loss would require mitigation. Impacts on wildlife associated with ruderal vegetation caused by construction and maintenance are less than significant.	Impacts on wildlife associated with riparian and wetland habitat loss would require mitigation. Impacts on wildlife associated with ruderal vegetation caused by construction and maintenance are less than significant.	Impacts on wildlife associated with riparian and wetland habitat loss would require mitigation. Impacts on ruderal vegetation are less than significant.
4. Cultural Resources	Impacts on known or buried cultural resources would be mitigated by stopping work at sites requiring excavation, if archaeological resources are discovered.	Low likelihood of encountering cultural resources.	Very likely to encounter cultural resources.

Issues of Concern	Channel Modification	Floodwall/Raise Levee	Bypass
5. Recreation Trail Opportunities	Maintains and enhances existing and future recreation plans by the Cities of San Jose and Santa Clara.	Maintains and enhances existing and future recreation plans by the Cities of San Jose and Santa Clara.	Maintains and enhances existing and future recreation plans by the Cities of San Jose and Santa Clara.

CHAPTER 5
RECOMMENDED PROJECT

5.1 Recommended Project Modifications by Reaches

The recommended project and construction procedures are described by reach in detail on the following pages and are shown in Appendix F, Engineering Drawings of Proposed Project, located at the end of this report. A detailed description of the maintenance guidelines and procedures by reach, summary tables, and typical sections are provided in Chapter 6 and Appendix D, Maintenance Guidelines.

Reach A

The project elements for this reach include levee raising and floodwall construction of less than 0.6 m (2 ft), aggressive vegetation maintenance in the first 120 m (394 ft) downstream of I-880, four invert stabilization structures immediately downstream of the 120-m (394-ft) reach, and moderate vegetation management outside of the SRA mitigation areas. The water surface elevation will be lowered to the desired target elevation of 17.86 m (56.8 ft; NAVD 88) at I-880, as a result of the sediment and vegetation management and downstream project improvements. The 17.86-m target water surface elevation is the required downstream boundary condition of the Downtown Project. A 0.6-m floodwall will be constructed on top of both banks from Highway 101 to Airport Island Bridge. Levees up to 0.6 m high will be constructed on the west bank from Airport Island Bridge to Airport Parkway Bridge. The embankment of Highway 87 will serve as the levee to the river on the eastbank. The proposed 5.5-m (18-ft) wide maintenance road on the top of bank will include eastbank underpasses for Highway 101 and Airport Island Bridge, a westbank underpass at Airport Parkway Bridge, east and westbank underpasses at Skyport Drive Bridge and access ramps. All maintenance roads and ramps will be surfaced with 0.3 m (1 ft) of aggregate.

The aggressive vegetation maintenance in the first 120 m (394 ft) downstream of I-880 involves regular cutting of vegetation to less than 0.3 m (1 ft) from inboard levee hinge to levee hinge, as necessary, to maintain a low Manning's roughness condition. Moderate vegetation management is required in the reach from Highway 101 Bridge crossing to the downstream end of the District's SRA. Only snag removal is permitted in the Caltrans mitigation planting bench. Limited vegetation management is permitted in the Restricted and Unrestricted Corps' SRA reaches.

Preliminary hydraulic analysis indicate that four additional grade control structures will be needed, downstream from the one that is currently in place at Station 17+588, 22 m (72.2 ft) downstream from I-880. The aggressive vegetation management in the first 120 m (394 ft) of Reach A, downstream of I-880 creates channel velocities as high as 4.57 m/sec (15 ft/sec). The steeper slope and higher stream energy characteristics of this reach are amplified as a result of the required maintenance. Bank protection will be required on the east bank between Highway 101 and 75 m (246 ft) upstream of the Airport Island Bridge crossing. The grade control structures will be designed to include a transition zone between the end of the ACM matting in the channel bed and gabions that exist in approximately the first 60 m (197 ft) downstream from I-880. This area is eroding and in need of repair, and will be considered carefully in final design to prevent a potential fish barrier. These channel stability issues will be addressed before invert stabilization and transition designs are finalized and incorporated into the flood protection plan. A detail view of a recommended structure is presented on the plan and profile (refer to Appendix F, Engineering Drawings of Proposed Project).

The locations of the aforementioned grade control or invert stabilization structures in Reach A, from Stations 17+470 to 17+555 in the low flow channel, are preliminary and will be defined in final design. The recommended type of structure is a vortex rock weir, which will be designed for the velocity and channel material. Construction of these structures will have to be made in stages with the river diverted around the work. The excavations will be de-watered, so that construction is performed in a dry channel.

General Construction Procedures. The results of field reconnaissance and geotechnical investigations indicate that the existing levees contain numerous animal burrows, cracks, slope erosions, and sloughing (URS Greiner 2000). The boring logs indicate that the upper 0.6 to 1.2 m (2 to 4 ft) of levee fill contains highly expansive clay soils in several locations. The existing levees will be upgraded before placing new fill or installing flood walls. The levee upgrade work will include removing trees, vegetation, and other debris; stripping off all cracks/erosion and sloughing areas; sealing animal burrows, and removing the upper 0.9 m (3 ft) of expansive fill as it is identified, and replacing it with compacted select fill. The extent of levee stripping, excavation and backfilling, fill specifications, and compaction criteria will be defined during final design. Typical construction of the floodwall along Airport Boulevard just downstream of Airport Parkway Bridge will begin with trench excavation, followed by form work installation, concrete pouring, backfill, and aesthetic texturing on the face of the wall.

The construction of continuous access under bridges includes removal of channel bank lining upstream and downstream of the bridges, ramp construction, and gabion installation. Coffer dams will likely be needed for most construction. The California Construction BMPs will be implemented.

A possible staging area for the construction equipment will be at the top of the west bank, upstream and downstream of Airport Island Bridge, Airport Parkway Bridge, and I-880 overpass. Access to the construction area will be at Airport Island Bridge, Airport Boulevard, and Airport Parkway.

Reach B

The project elements for this reach include levee raising, sediment and vegetation removal, and maintenance access road improvements. The proposed 5.5-m (18-ft) wide maintenance road on the top of banks will include underpasses for Trimble Bridge. Levees will be widened to meet the 5.5-m (18-ft) minimum width criteria. In some portions of this reach, engineered fill will be required to raise the levee heights 0.25 m (1 ft) to meet freeboard requirements. If slope easements cannot be obtained, the use of engineered fill to raise the levee crest will allow steeper levee slopes to avoid ROW and wetland encroachment that would result from relocating the toe of the levee.

Periodic sediment removal and moderate vegetation management will be required to maintain the design channel capacity. Excluding a 6-m (19.7-ft) riparian buffer on either side of the low flow channel, sediment will be removed in the overbank areas. Vegetation management will involve periodic removal of vegetation from the overbanks and inboard levee slopes.

Two sewer siphons near Stations 13+925 and 14+050 were identified in this reach. If deemed necessary, they will be relocated or modified before construction. The extent of this work will be better defined in final design when the exact location and condition of these siphons are verified through utility surveys.

Nine outfalls will be protected in place, and one minor outfall will require modification.

The access roads in this reach begin at or are near the edge of the Trimble Road ROW on top of the existing levees. The access roads continue along the top of both existing levees to Highway 101. Access from Trimble Road is through gates off Trimble Road just before the entrance to the bridge. There are ramps down to the channel apron adjacent to each bridge that provide access below both bridges. There is a turnaround on the east bank at Station 14+050. Two turnarounds are proposed by others on the east bank and west bank at approximately Station 14+450. The maintenance access roads will complement future recreational trail systems planned by the Cities of San Jose and Santa Clara.

Bank protection will be required for a length of approximately 100 m (328 ft) downstream of Highway 101 and approximately 150 m (492 ft) upstream of Trimble Road, because of increased channel bank velocities during the design event.

General Construction Procedures. The results of field reconnaissance and geotechnical investigations indicate that the existing levees contain numerous animal burrows, cracks, slope erosions, and sloughing (URS Greiner 2000). The boring logs indicate that the upper 0.6 to 1.2 m (2 to 4 ft) of levee fill contains highly expansive clay soils at several locations. The existing levees will be upgraded before placing new fill. The levee upgrade work will include removing trees, vegetation, and other debris; stripping off all cracks/erosion and sloughing areas; sealing animal burrows, removing the upper 0.9 m (3 ft) of expansive fill as it is identified, and replacing it with compacted select fill. The extent of levee stripping, excavation and backfilling, fill specifications, and compaction criteria will be defined during final design.

The construction of the levee embankment will be done through the conventional method of placing thin horizontal layers. The contractor will have to determine how to do this work. The use of large equipment will require a bench about 2.4 to 3.0 m (8 to 10 ft) wide. Using smaller equipment (e.g., Bobcat™ or hand-operated equipment) is an option. Foundation and slope preparation is necessary to expose a strong, dense material. Once exposed, the foundation will be scarified and kept moist to produce a good bond between the existing and new fill.

Reach C

The project elements for this reach include minor levee raising, vegetation and sediment removal, and maintenance access road improvements. Although sediment and vegetation removal results in a lowering of the water surface elevation, levee raising of up to 0.5 m (1.6 ft) of both levees will be needed to meet freeboard requirements. The most appropriate means for raising the levees in this reach is by conventional methods. The existing mitigation planting area and riparian corridor will not be disturbed.

Periodic sediment removal and moderate vegetation management will be required to maintain the design channel capacity. An approximately 30-m (100-ft) wide overflow channel will be re-excavated on the east bench. Vegetation management in this reach involves periodic removal of vegetation in a 30-m (100-ft) wide excavated overflow channel and inboard levee slopes.

Maintenance roads on top of the levees will be improved to meet the 5.5-m (18-ft) minimum width requirement. The existing depressed maintenance access roads will not be affected. Maintenance access will be provided under the Montague Expressway Bridge. The access roads begin at or near the edge of the Montague Expressway ROW on top of the existing levees. The access roads continue along the top of both existing levees until at or near the Trimble Road ROW. A depressed maintenance road begins with a ramp descending to the river apron on the east side of the river at about Station 12+000 and then extends to the Trimble Road ramps. The existing turnaround on the west levee at Station 12+850 will remain in place. These maintenance access roads will complement future recreational trail systems planned by the Cities of San Jose and Santa Clara.

General Construction Procedures. The results of field reconnaissance and geotechnical investigations indicate that the existing levees contain numerous animal burrows, cracks, slope erosions, and sloughing (URS Greiner 2000). The boring logs indicate that the upper 0.6 to 1.2 m (2 to 4 ft) of levee fill contains highly expansive clay soils at several locations. The existing levees will be upgraded before placing new fill. The levee upgrade work will include removing trees, vegetation, and other debris; stripping off all cracks/erosion and sloughing areas; sealing animal burrows, removing the upper 0.9 m (3 ft) of expansive fill as identified and replacing it with compacted select fill. The extent of levee stripping, excavation and backfilling, fill specifications, and compaction criteria will be defined during final design.

The construction of the levee embankment will be done through the conventional method of placing thin horizontal layers. The contractor will have to determine how to do this work. The use of large equipment will require a bench about 2.4 to 3.0 m (8 to 10 ft) wide. Using smaller equipment (e.g., Bobcat™ or hand-operated equipment) is an option. Foundation and slope preparation is necessary to expose a strong dense material. Once exposed, the foundation needs will be scarified and kept moist to produce a good bond between the existing and new fill. If slope easements cannot be obtained to raise the levees using conventional methods, gabions or reinforced earth will be used to raise the levee crest. Such a raise will be more flexible than the floodwall, and will require less ROW than the embankment raise. However, these structures will produce greater stress on the foundation soils.

Preliminary geotechnical analysis indicates significant settlement of the levees within a 1,000-m (3,280-ft) stretch upstream and downstream of Montague Expressway. Final design will consider the required additional levee raising needed to offset this potential settlement.

Reach D

The project elements for this reach include minor levee raising, vegetation and sediment removal, and maintenance access road improvements. Although sediment and vegetation removal improve the conveyance in this channel and lower the water surface elevation, raising the levees 0.7 m (2.3 ft) will be needed to meet freeboard requirements. The most appropriate means for raising the levees in this reach is by conventional methods. The existing mitigation planting area and riparian corridor will not be disturbed. Maintenance roads on top of the levees will be improved to meet the 5.5-m (18-ft) minimum width.

Access ramps will be reconstructed at 100 m (328 ft) downstream of Montague Expressway to the existing depressed maintenance roads. The existing depressed maintenance access roads will not be affected.

Periodic sediment removal and moderate vegetation management will be required to maintain the design channel capacity. Two 10.6-m (34.8-ft) wide overflow channels will be re-excavated to remove accumulated sediment in the overbanks. A 30.5- to 45.7-m-wide riparian buffer area that includes the low flow channel will be preserved. Only clearing and snagging will be allowed in the riparian buffer area. Periodic moderate vegetation management will be performed in all areas outside of the riparian buffer area.

Five major and five minor outfalls will require modification. Two outfalls will be protected in place.

The maintenance access roads begin at the Hetch Hetchy pipeline crossing and continue to the Montague Expressway Bridge on top of the existing levees. The depressed maintenance access roads begin upstream of the Hetch Hetchy pipeline and continue upstream to Station 11+550 where they ramp up to the elevated levee, then ramp back down to the Montague Expressway

Bridge undercrossings. The maintenance access roads will complement future recreational trail systems planned by the Cities of San Jose and Santa Clara.

General Construction Procedures. There is a good possibility that in areas where the ROW is too narrow for an embankment raise, the crest might be raised using gabions or reinforced earth. Such a raise will be more flexible than the floodwall, and will require less ROW than the embankment raise. However, these structures will produce greater stress on the foundation soils.

The results of field reconnaissance and geotechnical investigations indicate that the existing levees contain numerous animal burrows, cracks, slope erosions, and sloughing (URS Greiner 2000). The boring logs indicate that the upper 0.6 to 1.2 m (2 to 4 ft) of levee fill contain highly expansive clay soils at several locations. The existing levees will be upgraded before placing new fill. The levee upgrade work will include removing trees, vegetation, and other debris; stripping off all cracks/erosion and sloughing areas; sealing animal burrows, and removing the upper 0.9 m (3 ft) of expansive fill, as it is identified and replacing it with compacted select fill. The extent of levee stripping, excavation and backfilling, fill specifications, and compaction criteria will be defined during final design.

The construction of the levee embankment will be done through the conventional method of placing thin horizontal layers. The contractor will have to determine how to do this work. The use of large equipment will require a bench about 2.4- to 3.0-m (8- to 10-ft) wide. Using smaller equipment (e.g., Bobcat™ or hand-operated equipment) is an option. Foundation and slope preparation is necessary to expose a strong dense material. Once exposed, the foundation will be scarified and kept moist to produce a good bond between the existing and new fill. If slope easements cannot be obtained to raise the levee using conventional methods, gabions or reinforced earth will be used to raise the levee crest. Such a raise will be more flexible than the floodwall, and will require less ROW than the embankment raise. However, these structures will produce greater stress on the foundation soils.

In areas where it is difficult and expensive to provide a minimum 5.5-m-wide (18-ft-wide) maintenance road, the road will be designed to fit within the existing constraints.

Reach E

The project elements for this reach include minor levee raising, vegetation and sediment removal, and maintenance access road improvements. Although sediment and vegetation removal improve the conveyance in this channel and lower the water surface elevation, raising the levees 0.5 m (1.6 ft) will be needed to meet freeboard requirements. The most appropriate means for raising the levees in this reach is by conventional methods. The existing mitigation planting area and riparian corridor will not be disturbed. Maintenance roads on top of the levees will be improved to meet the 5.5-m (18-ft) minimum width requirement. A drainage canal is located adjacent to the outboard levee toe on the west levee between Stations 9+300 to 9+550 and from Stations 9+900 to 10+000. Raising the levee crest in these areas where the ROW is too narrow for an embankment raise will require gabions or reinforced earth. Such a raise will be more flexible than the floodwall, and will require less ROW than the embankment raise; however, it may produce greater stress on the foundation soils.

Preliminary geotechnical evaluations indicate that the east levee from approximately Stations 9+275 to 10+050, will require upgrading to meet FEMA stability requirements before placing new fill on top of it.

Periodic sediment removal and moderate vegetation management will be required to maintain the design channel capacity. Two 10.6-m-wide overflow channels will be re-excavated to remove accumulated sediment in the overbanks. A 30- to 45-m (100- to 150-ft) wide riparian buffer area that includes the low flow channel will be preserved. Only clearing and snagging will be allowed in the riparian buffer area. Periodic moderate vegetation management will be performed in all areas outside of the riparian buffer area.

Two major outfalls will require modification. Four minor outfalls will be protected in place.

The existing maintenance access roads begin at or near the edge of the Tasman Drive ROW and continue upstream to the Hetch Hetchy pipeline on top of the existing levees. There are access roads on both sides of the river with access below the Tasman Drive Bridge by means of ramps that are adjacent to the bridge. On each side of the river and bridge, there are ramps down to the apron of the channel to allow access below the bridge. There are depressed maintenance roads that begin with ramps down to the channel apron near Station 9+675 and continue to Hetch Hetchy. There are small ramps that direct traffic over the Hetch Hetchy pipeline. Depressed maintenance roads will not be affected or improved. Only maintenance roads on top of the levees will be improved. These maintenance access roads will complement future recreational trail systems planned by the Cities of San Jose and Santa Clara.

General Design and Construction Procedures. Final design will include a method for protecting the Hetch Hetchy pipelines. This area is underlain with Bay mud and therefore will have a weak foundation subject to settlement under added loads from the embankment.

The results of field reconnaissance and geotechnical investigations indicate that the existing levees contain numerous animal burrows, cracks, slope erosions, and sloughing (URS Greiner 2000). The boring logs indicate that the upper 0.6 to 1.2 m (2 to 4 ft) of levee fills contain highly expansive clay soils in several locations. The existing levees will be upgraded before placing new fill. The levee upgrade work will include removing trees, vegetation, and other debris; stripping off all cracks/erosion and sloughing areas; sealing animal burrows, and removing the upper 0.9 m (3 ft) of expansive fill, as it is identified and replacing it with compacted select fill. The extent of levee stripping, excavation and backfilling, fill specifications, and compaction criteria will be defined during final design.

The construction of the levee embankment will be done through the conventional method of placing thin horizontal layers. The contractor will have to determine how to do this work. The use of large equipment will require a bench about 2.4 to 3.0 m (8 to 10 ft) wide. Using smaller equipment (e.g., Bobcat™ equipment or hand operated equipment) is an option. Foundation and slope preparation is necessary to expose a strong dense material. Once exposed, the foundation will be scarified and kept moist to produce a good bond between the existing and new fill. If slope easements cannot be obtained to raise the levee using conventional methods, gabions or reinforced earth will be used to raise the levee crest. Such a raise will be more flexible than the floodwall, and will require less ROW than the embankment raise. However, these structures will produce greater stress on the foundation soils.

Reach F

The recommended project elements for Reach F include the Route 237 eastbound Bridge replacement option, floodwall construction on top of the inboard hinge of the levee, from the Route 237 Bridge crossing to Station 8+500, levee raising from Stations 8+500 to 9+227 on the east and west levee, rehabilitation of the west levee from Stations 8+200 to 8+600, and vegetation management.

Floodwall construction is the appropriate means of providing freeboard in the first 600 m (1,969 ft) of Reach F to avoid encroachment into ROW and two drainage canals adjacent to the outboard toe of the east and west levees. The encroachment into the canals located on the outboard side of these levees would result from raising the levees with 2H to 1V side slopes. The east drainage canal is located within Stations 8+100 to 8+600. The west drainage canal is located within Stations 8+100 to 8+600. The west drainage canal is located within Stations 8+100 to 9+200. The type of floodwall foundation will depend on the final design level geotechnical analysis. Floodwalls will be architecturally treated. The remaining levees from Stations 8+575 to 9+225 will be raised an average of 0.7 m (2.3 ft). In areas where the settlement of the levee is too great, or the ROW is too narrow for an embankment raise, the crest will be raised using gabions or reinforced earth. Such a raise will be more flexible than the floodwall and require less ROW than the embankment raise. However, these structures will produce greater stress on the foundation soils.

The levees will be upgraded to meet FEMA requirements before placing new fill to raise them or constructing floodwalls.

Sediment management has not been identified for this reach. Vegetation management in this reach will require cutting or substantially reducing, by means of herbicide treatment, the standing crop of vegetation at the beginning of each flood season.

Two sanitary sewer siphons at or near Station 8+100 were identified in this reach. If deemed necessary, they will be relocated or modified prior to construction. The extent of this work will be better defined in final design when the exact location and condition of these siphons is verified through utility surveys.

Six major and two minor outfalls will require modification. One minor outfall will be protected in place.

The access roads begin with the undercrossings at the downstream side of Route 237 westbound Bridge and continue with ramps to the top of the floodwalls on the upstream side of the Route 237 eastbound Bridge. The access roads continue on top of the levees to the ROW of Tasman Drive Bridge. There is no direct access from Route 237 to the levees. The access roads slope up from below Route 237, to the top of the floodwalls, then ramp down to the top of the levees. At Tasman Drive Bridge, ramps are provided down to the apron of the channel to allow access to the underside of the bridge. These maintenance access roads will complement future recreational trail systems planned by the Cities of San Jose and Santa Clara.

General Design and Construction Procedures. This area is underlain with Bay mud. There are several defects in the existing levee that need to be repaired. Final design will identify and consider the best method for this repair. The defects include erosion, gullies, replacement of erosion control mats, repair of animal burrows and tension cracks, and settlement. Excavation of the material from under the Route 237 Bridge will be carefully considered to be sure excavation does not weaken the approach embankment to the bridge. The design cut slope for the depressed maintenance ramps under the Route 237 Bridges will consider the stability of the cut slopes and the exposure/protection of the outfall pipes from the District Pump House.

The settlement caused by the construction of the ramps over the floodwall and the effects of this settlement on the floodwalls will be considered. The existing levee will be widened between Stations 8+055 and 8+750. A thin wedge of embankment will be required on the inside slope of the west levee to provide support for the floodwall. This thin wedge will be stable and permanent, and will be constructed using thin horizontal layers. To be able to support the floodwall, the foundation fill will have to be sufficiently strong to support the levee as well as the floodwall. The outside of the east levee shows a uniform thickness embankment for the full height of the levee. This also will have to be built in thin horizontal layers. Upstream of Station 8+525, the floodwall ends and the levee raise begins. The settlement effect on the floodwall will be addressed in final design. The effect of the levee on the San Jose Pump House and outfall pipes and other construction along the ROW will be addressed, as well as the effect of the outfall pipe on the stability of the levee. Upstream of Station 8+750, as shown in Appendix F, Engineering Drawings of Proposed Project, the levees on both sides will be raised and widened. Consideration will be given to the effect of seepage on the layering technique used to raise/widen the existing levee. Hydrostatic pressure should not be exerted on these layers nor should these layers seal off the seepage paths through the existing levees.

The overall stability of the levee, based on the preliminary geotechnical analysis, has a low factor of safety for a failure circle through the Bay mud. Final design will include provisions for the foundation strength and possible continuing settlement of the levees. The construction of the levee embankment will be made in thin horizontal layers. The contractor will determine how to do this work. The use of large equipment will require a bench about 2.4 to 3 m (8 to 10 ft) wide. Using smaller equipment (e.g., Bobcat™ or hand-operated equipment) is an option. Foundation and slope preparation is necessary to expose a strong dense material. Once exposed, the foundation will be scarified and kept moist to produce a good bond between the existing and new fill.

The following assumptions were made to determine the feasibility and preliminary construction estimate for the Route 237 eastbound Bridge replacement option:

- The proposed eastbound bridge and profile will be raised to match the existing westbound bridge and profile.
- The end of the proposed eastbound bridge will be approximately 30 m (100 ft) east of the existing abutment based upon the capacity requirements.
- With the exception of off-peak traffic periods, all four lanes of eastbound Route 237 will be open during construction.
- The eastbound lanes and shoulders will be reduced to 3.4 m (11 ft) and 0.6 m (2 ft), respectively, during construction.

The as-built plans of Route 237 were reviewed to identify any physical constraints that would prohibit replacing the bridge. No physical constraints or other existing conditions that would eliminate this alternative from consideration were identified. Following is a construction staging sequence (refer to Appendix F, Engineering Drawings of Proposed Project) that was developed to maintain all four lanes of eastbound Route 237 in use during construction. This construction staging sequence was prepared to address potential concerns expressed by Caltrans during preliminary discussions.

The eastbound Route 237 Bridge would be replaced in the following two stages:

- **Stage I:** The first stage would shift eastbound traffic to the south side of the existing eastbound bridge. The eastbound traveled way would consist of four 3.4 m (11 ft) lanes and 0.6 m (2 ft) shoulders. The bike lane would be detoured from eastbound Route 237 via Tasman Drive and First Street.

  A section of the existing eastbound bridge on the north side would be demolished and the same section of new eastbound bridge constructed to connect with the westbound bridge. This stage would also raise the roadway profile along the north side of eastbound Route 237 to match the westbound profile.

- **Stage II:** The second stage would shift eastbound traffic to the north side of the newly constructed eastbound bridge. The eastbound traveled way would consist of the same lane and shoulder configuration as the first stage. The bike lane would continue to be detoured from eastbound Route 237 via Tasman Drive and First Street.

  The remaining section of the existing eastbound bridge on the south side would be demolished and the new bridge constructed to extend the width of the eastbound bridge constructed in the first stage. The new eastbound bridge would be configured to its original dimensions 3.7-m (12-ft) lanes, two 3-m (10-ft) shoulders, and a 2.3-m (10-ft) bike path. The roadway profile would be raised to match the north side profile. The concrete barrier and soundwall along the bike path would be reconstructed.

To accelerate the start of construction, retaining walls and temporary shoring are proposed along the southern ROW of Route 237 to avoid an extensive property acquisition process. Temporary construction easements will be required to construct the retaining walls, shoring, and temporary soundwall. The construction will begin in late spring/early summer, assuming there is no property acquisition required and the environmental clearance is not delayed. Following the staging sequence described above, it will be possible to remove and replace the entire existing bridge by the Summer of 2003, thereby achieving the capacity requirements.

Reach G

The project elements for this reach include floodwall construction, vegetation and sediment removal, and maintenance access road improvements including new construction of depressed maintenance roads. Although sediment and vegetation removal improve the conveyance in this channel and lower the water surface elevation, floodwall construction will be required to meet freeboard criteria. The water surface elevation plus freeboard is expected to rise above the top of the levees an average of 0.8 m (2.6 ft) with up to 1.25 m (4.1 ft) at the Route 237, Gold Street and UPRR Bridge approaches. Because of the lack of ROW needed to raise the levees and to avoid wetland encroachment, floodwall construction is the appropriate method for protecting surrounding areas from the design flood event. Drainage canals located adjacent to the outboard toe of the east and west levees prevent the relocation of the outboard levee toe that would result from raising the levee height. Floodwalls will be located on the inboard levee hinge. The type of foundation for these walls will depend on the final design level geotechnical surveys. All floodwalls will be architecturally treated. The function of the Santa Clara Valley Transportation Authority (VTA) mitigation site on the downstream side adjacent to the Route 237 westbound Bridge will be preserved by placing the floodwall on the outermost levee.

The computed hydraulic performance of this reach is highly dependent on the periodic (i.e., approximately every 2 years) and aggressive removal of vegetation. This removal will maintain the capacity of the channel, lower the water surface elevation and reduce the required floodwall heights. The sediment and vegetation removal will occur as follows. A 12-m section adjacent to the toe of the depressed maintenance roads will be dredged to a depth of 1 m (3.25 ft). A 6-m

(19.7-ft) buffer will remain on both sides of the low flow channel to protect fish habitat, and herbicide treatment will be used to aggressively maintain the dense Tule vegetation in the remaining overbank areas.

One sanitary sewer siphon at or near Station 7+100 was identified in this reach. If deemed necessary, it will be relocated or modified prior to construction. The extent of this work will be better defined in final design when its exact location and condition is verified through utility surveys. Three major and two minor outfalls will require modification. Two outfalls will be protected in place.

The existing maintenance roads on top of the levees will remain and will be maintained at the minimum 5.5-m (18-ft) design width. The access roads begin with a turnaround near the edge of the UPRR trestle on top of the existing levees and continue upstream to Gold Street Bridge. Access is provided along the top of the levees to the next bridge at Route 237. A new depressed maintenance road will be provided on the east levee toe from UPRR to the downstream side of Gold Street where it will ramp up and over the top of the floodwall. An east and west depressed maintenance road will be constructed at the edge of the levee toe, beginning with turnarounds upstream of Gold Street to the Route 237 Bridges. These maintenance roads will be constructed at a width of 6.4 m (21 ft) and will be located at elevation 3 m (9 ft; NAVD 88), the elevation of the mean daily high tide. Maintenance access under Gold Street Bridge is infeasible because of the lack of clearance from the high tide elevation to the soffit elevation of the bridge deck. These maintenance access roads will complement future recreational trail systems planned by the Cities of San Jose and Santa Clara.

The existing turnaround on the east side of the river at Station 7+850 will remain. The access road, on top of the levee that defines the VTA mitigation site on the west side of the river, will serve as a turnaround. The area adjacent to the Route 237 westbound bridge, at the confluence of the VTA mitigation levee and District levee, will also serve as a turnaround.

General Design, Construction Procedures. The Community of Alviso is protected by the east levee in this reach. No detailed inspection was made of the levees; however, the results of field reconnaissance and geotechnical investigations indicate that the existing levees contain numerous animal burrows, cracks, slope erosions, and sloughing (URS Greiner 2000). This area is underlain by soft Bay mud and is located in an old river meander. The boring logs indicate that the upper 0.6 to 1.2 m (2 to 4 ft) of levee fill contains highly expansive clay soils at several locations. The existing levees will be upgraded before constructing the floodwalls. The levee upgrade work will include removing trees, vegetation, and other debris; stripping off all cracks/erosion and sloughing areas; sealing animal burrows, and removing the upper 0.9 m (3 ft) of expansive fill as it is located, and replacing it with compacted select fill. The extent of levee stripping, excavation and backfilling, fill specifications, and compaction criteria will be defined during final design.

Floodwalls will be designed using the Corps' Design Manual EM 1110-2-2502 entitled, "Engineering and Design, Retaining and Floodwalls."

There will be difficult confined access in this reach because of overhead lines and various outfall pipes penetrate the levee below the crest. However, most of the work will be done from existing levee roads. Foundation excavation and preparation will require careful workmanship to provide a water tight contact between the foundation soil and the retaining wall. Removal of sediment and vegetation from the channel will require cranes with long booms to reach the entire area outside of the buffer zone. Hand equipment and labor may be used to cut and move the vegetation.

This reach has outfall pipes located in the toe of the levees. Removing the sediment and vegetation in the vicinity of the overhead lines will be done with care. Access to the area under the bridges will be difficult and will require hand equipment. The settlement of the access ramps will be an ongoing maintenance issue.

5.2 Proposed Mitigation Measures in Alviso Baylands

During the LGRP Planning Study a reconnaissance level analysis of the Baylands (NHC 2001) determined that the downstream boundary of the project, Alviso Slough, does not have the capacity to carry the current project design flood without spilling a portion of the flow to the west into Ponds A5 to A8. This analysis concluded that the Alviso community under current conditions is vulnerable to flooding from Alviso Slough, and from Guadalupe River flows that leave the confines of the river in the downtown San Jose area and flow north along First Street into the Town of Alviso. Alviso floods from other sources.

The present-day capacity of Alviso Slough is approximately 193 cms (6,800 cfs; NHC 2001) at full tide cycle. This is considered to be less than a 10-year event. The Guadalupe River has a capacity of approximately 396 cms (14,000 cfs) under present-day conditions, thus exceeding Alviso Slough capacity (NHC 2000d). Therefore, flows exceeding 6,800 cfs in the Guadalupe River have been spilling into adjacent salt ponds. Because the objective of the LGRP is to reestablish the original design capacity of the river for the Corps' design flood event of 481 cms (17,000 cfs), constructing and implementing flood control projects in the Lower Guadalupe River and downtown reaches would increase the magnitude of floodflows from 396 cms to 481 cms (14,000 cfs to 17,000 cfs) delivered to Alviso Slough. Because Alviso Slough lacks the capacity to safely convey present-day maximum potential inflow from Guadalupe River and flows exceeding 6,800 cfs have been spilling into adjacent salt ponds, an increase in induced flooding and associated impacts to portions of the Baylands would result.

Under existing conditions, a one percent flood would extend throughout the Baylands to depths as shown on Table 5-1, with 396 cms delivered to the Baylands through Guadalupe River and 85 cms (3,000 cfs) through streets east of the Guadalupe River. The construction of the proposed LGRP will increase the flow to 481 cms delivered to the Baylands through Guadalupe River. Therefore, the improvements will protect some of the Baylands areas, which would normally flood in a one percent event. The LGRP will cause some areas to flood to a higher depth as shown in Table 5-1. To mitigate for this impact, the following measures are proposed:

- Design and install an engineered levee overtopping structure (flow control weir) on Alviso Slough's west levee across from the Town of Alviso to secure predictable managed overtopping from major flow events into Ponds A5 to A8, and reduce risk of overtopping causing levee failure.

- Design necessary pumping schemes to de-water critical environmental areas (Ponds A5, A7, A8D, and A8W). A8D is defined as a dry pond, and A8W is defined as a wet pond.

- Design and construct levee improvements on the east bank of Alviso Slough between UPRR and Alviso to prevent Guadalupe River induced flood flows from entering town.

A Baylands analysis was prepared (NHC 2001) to evaluate and compare the hydraulic performance of the following three conditions:

- ***Existing Conditions*** - in the Baylands with the Lower Guadalupe River current capacity flows (396 cms)
- ***Future Conditions without Baylands Mitigation*** - with LGRP in place
- ***Future Conditions with Baylands Mitigation*** - with LGRP in place

Existing Conditions. Existing conditions assume that all flows in excess of 396 cms (14,000 cfs) spill out of the Guadalupe River at downtown San Jose and travel north on First Street to Alviso. The existing levee that currently protects Alviso from high flows in Alviso Slough is overtopped during significant flood events. The 10-year tide elevation at Dumbarton Bridge is used as the downstream boundary condition to coincide with the time of peak discharge of the Lower Guadalupe River design hydrograph.

Future Conditions without Baylands Mitigation. Future conditions with LGRP in place and without mitigation assume the same flow conditions as existing conditions. All flows are kept within the confines of the river and are conveyed without any losses past UPRR and into Alviso Slough. Also, it would be assumed that there are no pumping contributions downtown of I-880 at peak or near peak conditions in the Lower Guadalupe River.

Future Conditions with Baylands Mitigation. This analysis assumed that mitigation components would be constructed to protect Alviso from incremental flooding as a result of constructing the

LGRP; that Cargill Ponds A5, A7, and A8 would continue to flood and the additional floodwater would be removed; and that sensitive wildlife refuge areas would have minimum impacts. No pumping at peak or near peak conditions in the Lower Guadalupe River would be assumed.

A comparison of the three conditions provided the incremental differences in inundation depths and duration of flooding so that the conceptual mitigation components could be defined. Table 5-1 presents these results for a 4-day design storm simulation.

Table 5-1
Inundation Depths for the 4-Day Design Storm Simulation

Baylands Study Component	Existing (Present-day) Conditions m (ft)	With – LGR Project and Baylands Mitigation m (ft)	With – LGR Project and Without Baylands Mitigation m (ft)
Alviso, California	2.2 (7.2)	1.22 (4)	1.31 (4.3)
Cargill Pond A5	1.76 (5.8)	2.04 (6.7)	2.13 (7)
USFWS Refuge (A6)	0 (0)	0 (0)	0 (0)
Cargill Pond A7	1.76 (5.8)	2.07 (6.8)	2.16 (7.1)
Cargill Pond A8W	2.47 (8.1)	2.77 (9.1)	2.87 (9.4)
Cargill Pond A8D	1.76 (5.8)	2.04 (6.7)	2.13 (7)

The Alviso Slough levee would be improved on the west and north of Alviso to protect it from Guadalupe River flows entering the town from Alviso Slough. The levee would be raised up to 0.5 m (1.6 ft). The Alviso Marina, currently in the planning stage by the Santa Clara County Parks and Recreation, will be designed to an elevation that matches the proposed levee height plus freeboard. The Alviso Slough plan and profile (refer to Appendix F, Engineering Drawings of Proposed Project) extends from the LGRP at UPRR to the Marina entrance. The coordination of these two components is essential to protect Alviso from project induced flooding conditions. Should the Santa Clara County Parks and Recreation plan to re-develop the Alviso Marina the District would prepare a supplemental EIR to construct a levee or short floodwall around the Alviso Marina.

The overflow weir located adjacent to pond A8, as illustrated in Appendix F, Engineering Drawings of Proposed Project, will be designed to allow overtopping of flows on Alviso Slough's west levee, across from the Town of Alviso. This weir will allow managed overtopping from major flood events into Ponds A5, A7, A8D, and A8W.

To minimize environmental impacts due to permanent construction features, temporary 1.4 cms (50 cfs) pumps would be used to drain the ponds after a flood event to shorten the duration of inundation. Table 5-2 provides the results of the design event drawdown, using 1.4 cms (50 cfs) pumps to drain Ponds A5, A7, A8D, and A8W.

Table 5-2

Design Event Pumping Drawdown of Ponds A5 to A8 (excluding A6) Returns with LGRP Pond Stages to Existing Conditions Stages

	Existing Conditions		With LGR without Mitigation	Volume to Pump	Duration to Pump
Site	**Total m² (ac)**	**Inundation Depth m (ft)**	**Inundation Depth m (ft)**	**Volume km³ (af)**	**Duration (days)**
A5	2,537,359 (627)	1.77 (5.8)	2.13 (7)	92.8 (752)	26
A6	1,384,014 (342)	0 (0)	0 (0)	0 (0)	--
A7	1,052,175 (260)	1.77 (5.8)	2.16 (7.1)	41.7 (338)	24
A8W	1,679,432 (415)	2.47 (8.1)	2.87 (9.4)	66.5 (539)	25
A8D	732,475 (181)	1.77 (5.8)	2.13 (7)	26.8 (217)	23
NOTES: (1) Using 1.4 cms (50 cfs) pumps (1 per pond); (2) Pumping duration includes 2 weeks from beginning of storm needed to get pumps out to the field and operational; (3) 0.03 cms-day (1 cfs-day) equals 1.98 acre-feet.					

Figure 5-1 depicts the use of four 50 cfs (1.42 cms) pumps to drawdown Ponds A5, A7, A8W, and A8D after they have been inundated by the design flow. The "With Project" condition (blue line) does not include mitigation improvements. The graph extends out 26 days. Pond A7 becomes isolated around day 25 because of the overall water surface elevation reduction. If pumping would continue beyond the 26-day period, the ponds would become isolated. Drawdown rates for the individual ponds would be independent of one another, as each of the ponds has a different storage capacity.

As an option, one direction outfall culverts to drain the ponds were considered. The District would have better control of drawing Cargill ponds with temporary pumping versus use of outlet culverts. Impacts on marsh habitat would be lessened with temporary pumps compared to habitat impacts that would result from installation of outlet culverts. Figures 5-2 and 5-3 illustrate the general location and typical design of these outlets, as described below:

This outfall culverts discharge stored floodwater into Alviso Slough and Guadalupe Slough. They are characterized as a 2.4-m (8-ft) diameter conduit, 23 m (75 ft) in length, and varying invert elevations. For example, the invert elevation of pond A8W is 1.5 m (4.9 ft). Including the conduit, headwall/endwall, scour apron, and bank replacement, the estimated footprint for a single 2.4-m (8-ft) diameter outlet is 15 by 30 m (50 by 100 ft). The discharge end of the conduit would have a "duckbill" or "tideflex" rubber type outlet which allows gravity discharges during lower tide periods without any backflow into Pond A8W during high tide periods.

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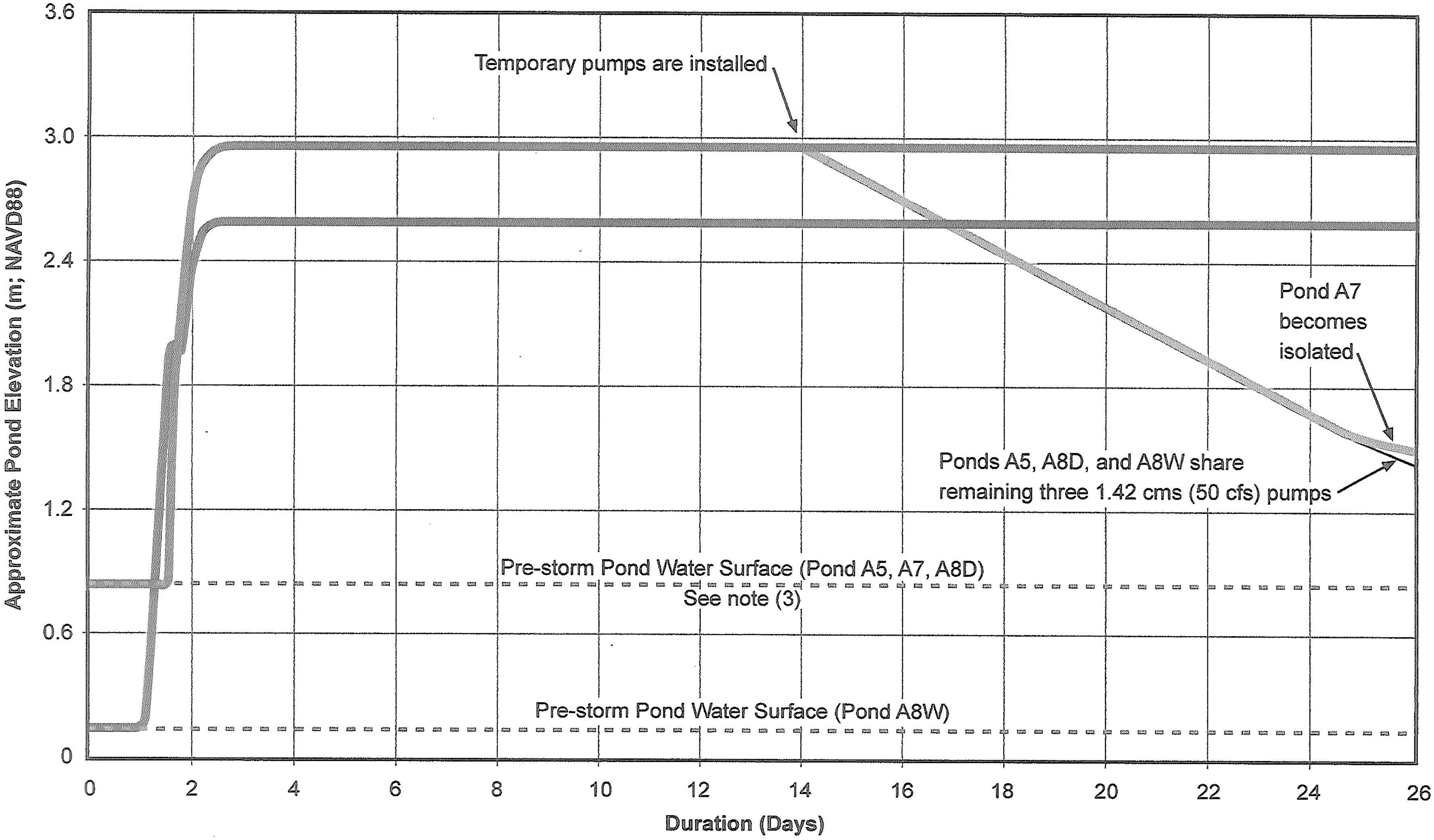

LEGEND

▬ Existing Conditions Following a Flood Event (1)

▬ With LGRP Project Without Pumps (2)

▬ Future Conditions With Pumps

NOTES

(1) Qpeak = 396 cms (14k cfs)
(2) Qpeak = 481 cms (17k cfs)
(3) Pond A8D pre-storm elevation (D indicates pond is dry)

Source: Northwest Hydraulic Consultants, 2001.

Figure 5-1
Pond Drawdown
Lower Guadalupe River Project

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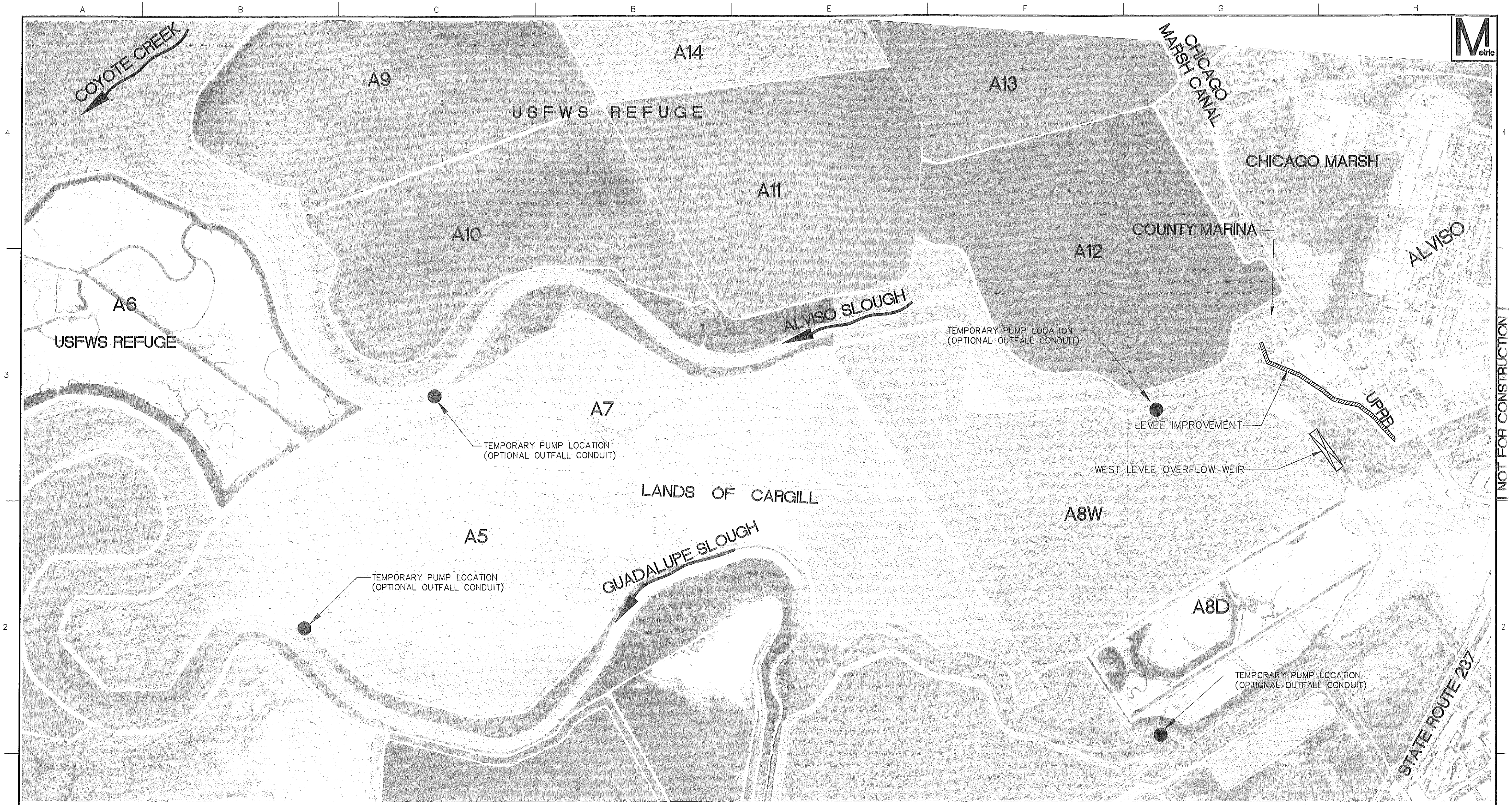


NOT FOR CONSTRUCTION

LEGEND:

▨	LEVEE IMPROVEMENT LOCATION
☒	LEVEE WEIR LOCATION
●	TEMPORARY PUMP LOCATION (OPTIONAL OUTFALL CONDUIT)
A5	POND DESIGNATION

200 100 0 500
SCALE IN METERS

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04

DATE AUG, 2001
DESIGN J.A.M.
DRAWN J.A.M.
CHECKED D.V.R.

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
PROJECT ENGINEER
DATE

LOWER GUADALUPE RIVER
FLOOD PROTECTION PROJECT
ALVISO BAYLANDS IMPROVEMENTS
PLAN

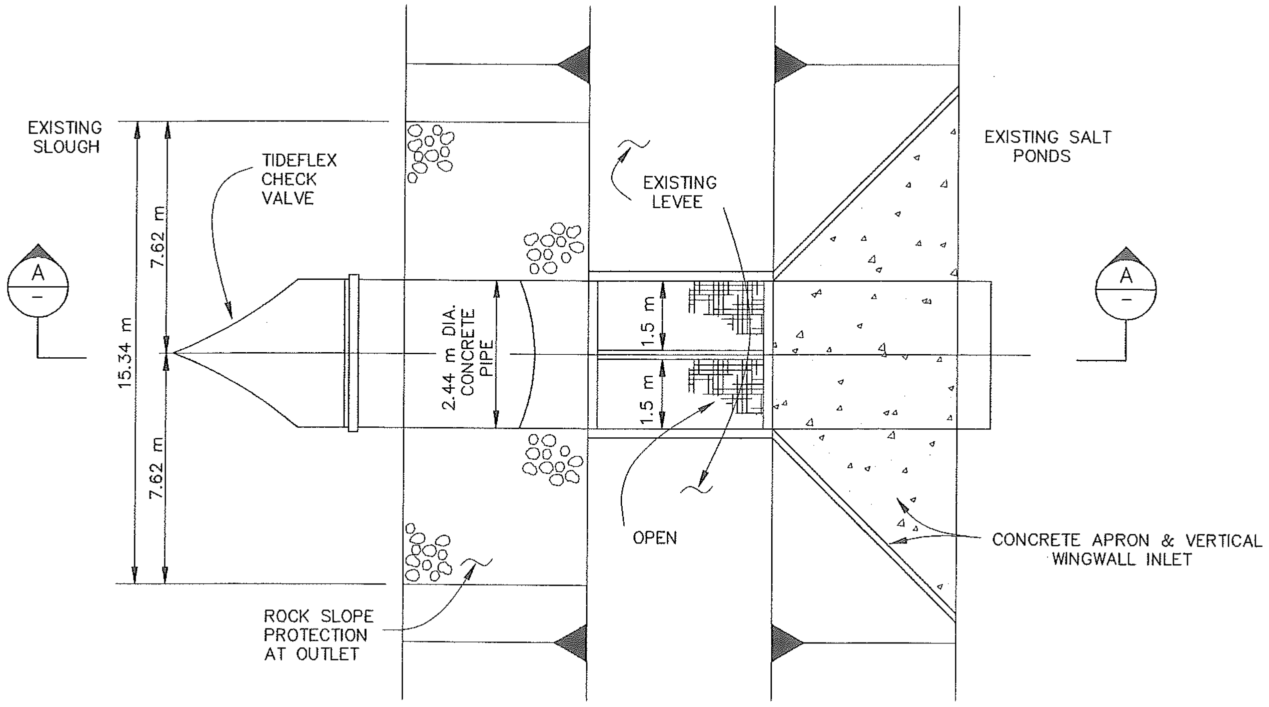
VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE AS SHOWN

FIGURE
5-2

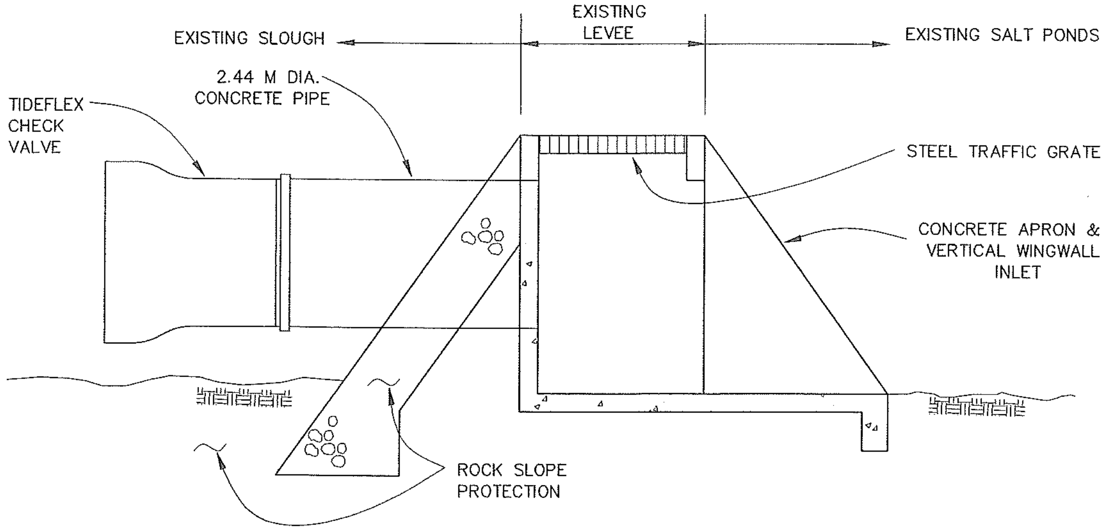
PROJECT: 153735
DWG NAME: Acad\Rpt\S42-RPT.dwg
X-REF(S): Acad\Xrefs\baylnds.dwg

Metric



1 DRAINAGE OUTLET OPTION

NTS



A SECTION A–A

NTS

I NOT FOR CONSTRUCTION I

PROJECT: 153735
DWG NAME: Acad\Rpt\S46-RPT.dwg
X-REF(S): SC-BDR1.DWG

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04

DATE	AUG. 2001
DESIGN	D.V.R.
DRAWN	J.C.
CHECKED	D.V.R.

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
DATE
PROJECT ENGINEER

LOWER GUADALUPE RIVER
FLOOD PROTECTION PROJECT
ALVISO BAYLANDS IMPROVEMENTS
DETAILS
DRAINAGE OUTLET OPTION

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE

FIGURE
5-3

5.3 Best Management Practices

California construction BMPs will be implemented during construction activities. The following are some of the BMPs pertinent to this project (Stormwater Quality Task Force, March 1993).

5.3.1 BMP for Scheduling

The BMP for scheduling includes the following guidelines:

- Major grading operations will be scheduled during dry months.
- Sufficient time will be provided before rainfall begins to stabilize the soil with vegetation.
- The site will be stabilized year round from erosion and sediment build up.
- Only portions of the site will be disturbed at any one time, and grading will be completed immediately. Disturbed portions of the site will be stabilized before grading the next portions.
- As the work progresses, cut and fill slopes will be revegetated wherever feasible and appropriate.
- Trenching will be scheduled so that most open portions of the trench are filled before new trenching begins.

5.3.2 BMP for Temporary Stream Crossings

The BMP for temporary stream crossings includes the following guidelines:

- Use of temporary stream crossings would not be allowed for general public traffic.
- Crossings will be designed by a California registered engineer.
- The crossings will be sized and installed according to the drainage design criteria of the local municipality. Design criteria will be based on standard engineering practices with provisions for minimizing impacts on disturbed crossing areas.
- During summer construction where the stream is constantly dry, a ford is sufficient for temporary access. However, where the stream flows continuously throughout the year or where there are frequent rains, temporary culverts or bridges will be more appropriate. Where used, these culverts and bridges will be sized to pass a significant design storm.

- The temporary stream crossings will be protected against erosion, both to prevent excessive sedimentation in the stream and to prevent washout of the crossing.
- The stream crossing will be inspected weekly and after each significant rainfall. Silt would periodically be removed from crossings. Aggregate lost from inlets and outlets of culverts will be replaced.
- Construction of temporary stream crossings will be at or near the natural elevation of the streambed to prevent any potential flooding upstream of the crossing.

5.3.3 BMP for Preserving Existing Vegetation

The BMP for preserving existing vegetation at the site includes the following guidelines:

- Existing vegetation to be preserved will be flagged.
- The root system of trees to be preserved will be staked off before construction.
- The limits of grading or disturbance will be clearly marked at all times.
- Construction traffic routes and spoil piles will not be located where adverse impacts to the existing vegetation may occur.

5.3.4 BMP for Dust Control

The BMP for minimizing dust occurrence at the site includes the following guidelines:

- Key access points will be identified and stabilized before commencement of construction.
- Where possible, construction traffic will be directed to stabilized roadways within the project.
- Watering of dust prone areas will be frequent, but not excessive, to minimize the impact of dust particles.
- The number and activity of vehicles on a site at any given time will be controlled.
- Haul trucks transporting materials will be provided with covers.
- Sediment deposited on paved roads will be rapidly cleaned up.

5.3.5 BMP for Construction Road Stabilization

The BMP for stabilizing construction roads includes the following guidelines:

- Temporary access roads will be stabilized immediately after grading and maintained to prevent erosion and control dust.
- Gravel will be used for temporary roadways during rainy seasons and/or on slopes greater than 5 percent.
- The roadways will be carefully graded to drain transversely.

5.3.6 BMP for Stabilized Construction Entrance

The BMP for stabilizing temporary access roads includes the following guidelines:

- Access roads will be constructed on level ground where possible.
- The minimum depth of rock will be as recommended by a soils engineer.
- The minimum turning radii for entrance or exit to and from the temporary access road would follow the District's maintenance guidelines as set forth in Ordinance 83-2.

5.3.7 BMP for Temporary Drains and Swales

The BMP for temporary drains and swales includes the following guidelines:

- Temporary drainage swales will be sized using local drainage design criteria. They will be designed so as not to adversely impact upstream or downstream properties.
- At a minimum, the drain/swale would conform to predevelopment drainage patterns and capacities.
- The drain/swale will be constructed with an uninterrupted, positive grade to a stabilized outlet.
- Energy dissipation measures will be provided if the flow out of the drain/swale can reach an erosive velocity.
- The drain/swale will be inspected weekly and after each rain for erosion or sediment build up.

- If there is a possibility for significant erosion to occur, the drainage swale will be stabilized using vegetation, chemical treatment, rock riprap, matting, or other physical means of stabilization.

CHAPTER 6
MAINTENANCE PROGRAM

6.1 Maintenance History and Purpose

Extensive and routine maintenance activities were conducted on the Lower Guadalupe River in Reaches D through G between 1987 and 1999. Activities included removal of herbaceous and woody plants using mechanical means, chemical treatment, and hand labor. These activities occurred throughout the project area but were concentrated near bridges where maximum flood conveyance capacity is needed. Landscaping and rock protection were also installed in some areas. In addition, between 1987 and 1992 the District removed limited amounts of sediment in the project area. The potential environmental effects of these routine maintenance activities had been evaluated in an EIR prepared by the District (SCVWD 1982). The composition of plant and wildlife communities in the project area today is more dense than that envisioned in the 1982 ER due in part to the sporadic frequency and extent of vegetation and sediment removal conducted since 1982.

In November 1992, a memorandum was prepared (SCVWD 1992) to update the maintenance guidelines for the Guadalupe River, UPPR to Highway 101. The update was based on a January 1992 aerial survey of the sediment and vegetation in the channel and design modifications reflecting installation of a revegetation mitigation project. Based on aerial survey data, hydraulic analysis of the channel performance verified the October 1991 standards for "the acceptable maintenance condition for each part of each facility" (i.e., allowable limits for channel dimensions and characteristics degraded from siltation and vegetation). The survey showed the tidal reach from UPPR (then referred to as 'SPRR' or Southern Pacific Railroad) to Montague Expressway experienced significant siltation. Silt was deposited in the low flow channel, which reduced the top width and expanded the vegetated benches on either side. Levee settlement in the order of 0.15 m (0.5 ft) occurred, and the channel exceeded the "acceptable maintenance condition" (SCVWD 1992).

The survey also illustrated that the fresh water reach between Montague Expressway and Trimble Road experienced siltation, scour, and levee settlement. Silt [0.9 m (3 ft)] and scour (0.6 m [2 ft]) occurred in the lower and upper ends of the high flow channel, respectively. Levee settlement was on the order of 3 cm (0.10 ft). Silt removal and a planned mitigation revegetation project of the high flow channel were investigated in conjunction with the aerial survey study. The maintenance standards for the top width of the high flow channel were modified from 42.7 to 30 m (140 to 100 ft) to account for the revegetation project (SCVWD 1992). The remaining fresh water reach between Trimble Road and Highway 101 did not experience any significant degradation because of levee settlement or silt and vegetation accumulation (SCVWD 1992).

This chapter outlines the maintenance guidelines, limits, methods, and monitoring program for the recommended project. A monitoring program will be necessary to identify required frequency of vegetation and sediment removal. An initial removal of sediment and vegetation will be performed at the time the project is constructed, as described in the Maintenance Guidelines section. These ideal channel conditions, in conjunction with the recommended project in place, would provide the required 481 cms (17,000 cfs) design conveyance capacity. Using the observations made through the proposed Monitoring and Adaptive Management Plan, a subsequent maintenance cycle will be developed to optimize the long-term implementation of flood-control operations and maintenance in the LGRP area.

These activities have been identified exclusively for the project limits (Figure 6-1, Key Map of Maintenance Guidelines for Vegetation and Sediment Management). All maintenance activities, as described in this chapter, are to be performed only within District ROW as stated in the District Engineering Policy and Procedures, Policy 3-330.

Maintenance activities within the channel will be scheduled to minimize adverse impacts to fish and wildlife resources and their habitat as described in the EIR. Periods of concern are March through June for nesting birds and October through March for fish passage.

6.2 Maintenance Standards

The LGRP maintenance program following the goals of the Stream Maintenance Plan (SMP), is designed to provide long-term guidance to the District to effectively implement routine stream maintenance. Stream maintenance is required to meet the District's flood protection and water supply mandates. This authority is provided by the District Act, as amended. Maintenance Standard is the condition produced at the end of construction. When conditions exceed the acceptable maintenance limit, the maintenance activity will restore the maintenance standard.

The District's goal regarding flood management is to "conduct a community-supported program that protects lives and property, is financially supportable, provides good value and is environmentally sensitive." As stated in the District's 1998/1999 Budget District-Wide Goals and Objectives, the adopted three objectives in support of its flood management goals are to: (1) ensure flood management system performance reliability, (2) minimize the risk and damage from flooding, and (3) maintain cost-effective flood protection. Sediment removal, vegetation management, and bank protection are the primary activities used to accomplish the flood management goal.

The objectives of the LGRP maintenance program (guided by the SMP) are as follows:

1. Standardize and codify practices and protocol for routine sediment removal, vegetation management, and bank protection in and around the streams and related facilities within the District's jurisdiction.
2. Identify cost-effective routine stream maintenance practices and protocol.

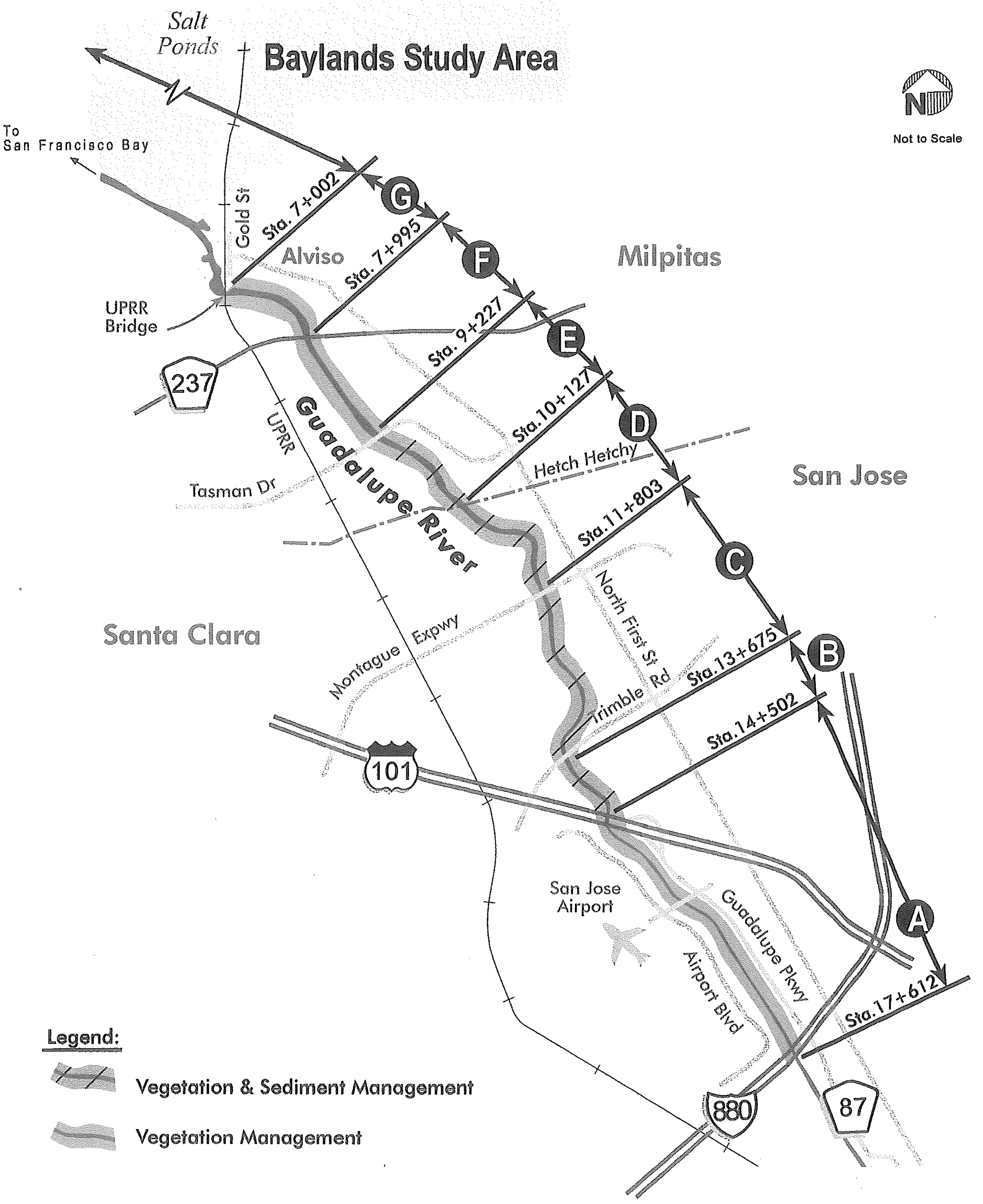


Figure 6-1
Reaches A to G
Key Map of Maintenance Guidelines for Vegetation and Sediment Management
Lower Guadalupe River Project

Note:
All reach limits are from downstream face of bridge to downstream face of bridge, except at Hetch Hetchy Pipeline.

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maintenance that requires the operation of heavy equipment in the channel is limited to the dry season.

6.2.3 Sediment Removal

Sediment removal is the act of mechanically removing sediment deposited within a stream. Typically, sediment is removed when it (1) reduces capacity, (2) prevents facilities or appurtenant structures from functioning as intended, or (3) impedes fish passage and access to fish ladders.

The District's purposes in performing sediment removal activities are to ensure that a stream will continue to provide flood capacity and to ensure that appurtenant facilities are working as designed. Sediment is usually removed from modified channels. However, sediment is also removed from natural creeks, on an occasional basis, to provide proper functioning of outfalls, culverts, bridge crossings and stream gauging stations, for example.

Typical equipment used for sediment removal includes excavators, draglines, loaders, and 7.6 and 15.3 m^3 (10 and 20 cubic yards [y^3]) dump trucks. If water must be bypassed around the site during work, water pumps and piping, and cofferdams of earth, gravel, sandbags, hay bales, rubber or other appropriate material may be used. In some cases, a bypass channel or detention basin is appropriate to isolate a site. Saturated sediments may be temporarily placed adjacent to the work site to dry out before being removed to a landfill or to other suitable disposal or reuse sites. Most often, sediment removal projects are implemented in the dry season (summer). The District also implements BMPs to ensure that sediment removal projects have the least impact possible. The District's equipment and work methods are updated as new equipment or better methods become available. Sediment removal projects are also revised as new capital improvement projects (CIP) are completed.

6.2.4 Vegetation Management

Management of vegetation in and adjacent to creeks is necessary to maintain the ability of channels to function as flood control facilities. Dense vegetation can adversely affect the ability of the channel to contain the volume and velocity of flood waters for which it was designed. Therefore, most flood control facilities require some type of periodic vegetation removal. Depending on the original design and the characteristics of the channel, the frequency of vegetation management varies from annually to every few years.

The District also installs and maintains revegetation or mitigation projects, often along creeks. In the first few years, it is important to control weeds at revegetation sites to increase the number of native trees and shrubs which survive and to more quickly establish a self-sustaining plant community which provides wildlife habitat.

The control of invasive, non-native plants is another purpose for which the District undertakes vegetation control. These plants can migrate into other areas where they can affect channel capacity as well as reduce native plant populations. Plant species are targeted that are not native to this area of California and are known to aggressively spread. This can lead to reduced channel capacity and overall habitat degradation. Current practice is to assign this a lower priority and do it on an ad hoc basis as it fits in with higher-priority work.

The District manages vegetation for other purposes including the protection of levees, and concrete linings from plant roots; meeting local fire codes requiring the control of combustible weeds and grasses; providing visual clearance to inspect the condition of a facility; and providing access along maintenance roads.

Vegetation Management Methods

For the past 30 years, the District has continually revised vegetation management approaches to control vegetation on District facilities. This approach consists of balancing three basic methods: hand removal (chain saws, weed-eaters, etc.); mechanical (mowing and discing); and chemical control through the use of herbicides. A method or combination of methods is chosen for each site depending on the maintenance requirements of the facility. Efficiency, economics and the protection of public health and environmental resources are all considered in the selection of methods.

As an example, herbicides can often be a more effective vegetation control method when compared to mechanical or hand removal. This is because of their ability to spread into and damage the roots of the target plants, thus preventing resprouting. When treated with mechanical or hand methods, some woody plants, such as willows, will resprout with multiple stems. The multiple sprouts result in a greater flood control problem and require annual control. With herbicides, annual retreatment is often necessary; however, the treatment area is greatly reduced, as only a small percentage of regrowth will occur.

The District only uses herbicides according to the label directions and for uses approved by the USEPA and the California Department of Pesticide Regulation. Currently, the primary herbicides which the District uses are Roundup® Pro and Rodeo®. These herbicides are formulations of the chemical glyphosate, which is a non-selective broad spectrum herbicide. Rodeo® is approved for use in aquatic areas, whereas Roundup® Pro is not approved for application directly in water or to areas where surface water is present.

Vegetation management activities are relatively consistent from year to year. Slight variations in flood control activities occur because of weather patterns. For example, historically, increases in work have occurred during flood years, with decreases occurring during extended periods of drought. ROW activities remain constant regardless of these weather patterns.

6.2.5 Bank Protection

Bank protection involves an action by the District to repair stream banks that are eroding (repair) or are in need of preventative erosion protection. The District implements bank protection when the problem (1) causes or could cause significant damage to a property or adjacent property, (2) is a public safety concern, (3) negatively affects transportation or recreational use, (4) negatively affects water quality, or (5) negatively affects riparian habitat. Repairs may take several forms from installing "hard" structures (e.g., rock, concrete, sack concrete, gabions) to "soft" structures (e.g., willow brush mattresses, log crib walls, pole plantings).

Stream bank erosion is a natural process, which mostly happens during major storm events. Erosion can occur because of hydraulic forces and geotechnical instabilities, and can be accelerated by human intervention and land uses. Accelerated erosion is typically a result of particular land uses that affect the stream corridor, including grazing, agriculture, and road and utility construction. In a constrained urban setting, erosion of banks can result in increased sediment deposition, which can lead to decreased flood flow capacities and potential flood hazards. Erosion on banks may also cause vegetation and soil loss, damage to private or public property, transportation impacts, safety hazards, and turbidity injurious to fish and aquatic life. Levee erosion may lead to failure of the structure and flooding.

Bank protection work may either occur as repair of an existing bank protection project, which is failing, or as new work along a bank which is eroding. The new work is considered routine maintenance because it is either restoring the flood control function of a modified channel or it is repairing a natural bank to its approximate condition prior to becoming an erosion problem.

Repair of existing bank protection structures occurs when these structures fail and are replaced with in-kind, in-place materials. New bank protection projects are those that repair or protect the watercourse from further degradation or erosion using the softest method appropriate. This type of protection is considered maintenance if the maintenance does not significantly alter the flood conveyance capacity of the streams.

Equipment used for bank protection may include excavators, dozers, cranes, loaders and 7.6 and 15.3 m^3 (10 and 20 y^3) dump trucks, concrete trucks, and pumps and water trucks. If water must be bypassed around the site during repair work, water pumps and piping, and cofferdams of earth, gravel, sandbag, hay bales or rubber or other suitable material may be used. In some cases, a bypass channel or detention basin is appropriate to isolate a site. Most often, bank protection projects are implemented in the dry season.

Bank Protection Methods

Design of a particular bank protection project is based on the characteristics of the site, including bank slope, sheer stress, location (such as the inside or outside of a curve), soil type, flow velocity, characteristics of the channel adjacent to the site and the available ROW. The site is evaluated for the "softest" repair method consistent with the characteristics of the site. Revegetation potential is also evaluated for each bank protection project. This potential is not only dependent upon the method of bank protection used, but also the physical properties of the stream where the repair is taking place.

In natural stream conditions, where there are no flow capacity requirements, vegetation components for stream bank repair are selected. In modified creek channels where the flow requirements must be retained (such as for the design flood), this will often necessitate a roughness maximum which, depending on the channel design, may limit the vegetation component of the design.

For all bank protection projects, the District inspects the stream upstream and downstream from a project site to determine if there is an identifiable cause of the erosion. In some cases, the cause of erosion is obvious (e.g., downed tree, or weak stream banks of silt or gravel stratas). In other cases, a further inspection is conducted to determine if flows are being directed toward the bank from a source upstream, whether the channel invert is down cutting, or if illegal drainage is causing the problem. These factors can affect the bank protection approach implemented by the District.

6.2.6 Maintenance Guidelines for the Lower Guadalupe River

Flood Interaction

The LGRP is designed to provide maintenance and flood fighting access on the levees and at all bridges.

Sedimentation and Scour Debris at Proposed Route 237

The Guadalupe River at Route 237 is within the area of tidal influence from San Francisco Bay. Tidal areas at or below high tide levels have historically tended to fill with bay mud as fine silt and organic material settles out from the bay waters. Normally, a low flow channel is preserved by higher velocity flows concentrated in a narrow channel on the retreating tide cycle. Channel bottom areas on either side of the low flow channel may be expected to fill to at least high tide elevation unless the channel is maintained. The bottom areas on either side of the low channel generally develop low tidal marsh type vegetation, which promotes the deposition of silts and limits the erosion of silts during high flow events.

The hydraulic design assumes a low flow channel with a maximum top width of 9.1 m (30 ft), and sedimentation to elevation –1.0 m (NAVD 88; 0.3 ft) outside the low flow channel. Typical velocities through the Guadalupe River Bridge during the design flood condition would be 1.7 to 2.1 m/sec (6 to 8 ft/sec). Limited scour would be expected for the sediments, which have had an opportunity to become compacted and chemically/physically bound together.

The most recent unconsolidated surface mud in the channel invert would be washed away more easily. Typical scour depths of 0.6 to 1.2 m (2 to 4 ft) would be expected for the design flood.

The bridge piers would be designed to be within and set back from the low flow channel; however, the channel may be modified or meander in the future. The proposed piers would include continuous foundation piles up to the bridge deck with web walls connecting the exposed portion of the piles up to the bridge deck. No significant damage would be expected from channel scouring around the piles or web walls.

The Guadalupe River is subject to significant floating debris and bed load debris in the upper watershed in the south San Jose area. Should the channel continue to be maintained per the LGRP maintenance program the debris conditions at this bridge should be manageable.

Maintenance Monitoring and Control

The sediment and vegetation removal activities in these maintenance guidelines incorporate the District's current management practices and procedures. This O&M Plan applies to the Preferred Alternative.

The Lower Guadalupe River Sedimentation Study (NHC 2000a), recently released by the District, concluded that the river is essentially divided into two distinct zones with respect to sedimentation. Montague Expressway to Alviso (Reaches D, E, F, and G) is characterized by a flat slope, low energy conditions, a well defined low-flow channel and aggrading inset bench areas adjacent to the existing levees. These conditions distinguish the downstream portion of the Lower Guadalupe River (including the reach influenced by tidal processes) as a depositional zone. The non-tidal zone, from I-880 to upstream of Montague Expressway (Reaches A, B and C), with its steeper slope and higher stream energy, is depositional in Reaches B and C and erosional in Reach A.

To ensure that the designed channel capacity and fish passage can be maintained for the 100-year life of the project, moderate management of sediment in Reaches B through E and aggressive sediment management in Reach G will be required. Based on the Lower Guadalupe River Sedimentation Study, most of the sediment deposition occurs in Reaches B, C, D, and E (approximately 15,000 to 17,000 tons per year, based on comparison of historical cross-sectional surveys). Our initial projection for sediment removal for a period of normal runoff in Reaches B, C, D, and E is an average of every 10 years and every 2 years for Reach G based on the acceptable maintenance conditions established (Appendix D).

Sediment removal procedures will involve the use of equipment such as excavators, drag lines, loaders, and 7.6 and 15.3 m^3 (10 and 20 y^3) dump trucks. This activity will only be practiced in the summer months. Fish passage will be provided from the excavated areas to the low flow channel to prevent fish entrapment. A typical illustration is provided in Appendix F.

Current District vegetation management practices are in place for protection of levees, protection of concrete linings from plant roots, controlling combustible weeds and grasses, inspection of facilities, and for facilitating maintenance and flood fighting road access. The District also manages vegetation to maintain design channel conveyance. This vegetation removal is separate from the vegetation lost as part of the sediment management activities in Reaches B to E and Reach G. In mitigation sites in Reach A, the size and growth of riparian forest, riparian scrub, seasonal and perennial wetland vegetation and ruderal herbaceous vegetation will be controlled as described in the Monitoring and Adaptive Management Plan, an important component of the MMP for the LGRP. Selective vegetation removal will occur between mitigation sites of Reach A that are not proposed for riparian planting by the Corps and Caltrans. Vegetation maintenance will also occur adjacent to the Corps and Caltrans mitigation areas to control woody vegetation recruitment outside of the mitigation planting corridors. Vegetation maintenance will be performed in alternating strips on either side of the channel, to ensure that as much wildlife habitat as possible is maintained for each reach. It is the District's goal as part of the vegetation management program to balance the need for periodic removal of debris and vegetation for flood control with the need to maintain and enhance ecological functions and values in the Lower Guadalupe River. The District may choose to mulch this vegetation in the channel, a common BMP practice. This process may also involve selective herbicide use to eliminate invasive plants.

Following is a description of vegetation and sediment management activities, per reach, that will be part of the Preliminary Baseline Maintenance Program. Typical sections and a table that outlines these activities are also provided to illustrate and define these guidelines (Appendix D, Maintenance Guidelines, Tables D1 to D-10 and Figures D-1 to D-9). These tables and illustrations provide pertinent information such as design roughness coefficients, limits of vegetation and sediment removal, sediment removal depths, vegetation threshold limits, and buffer zones.

All Bridges

Sediment Management. Bridge transition areas in all reaches, within 30 m (100 ft) upstream and downstream of the bridge, will be managed to remove sediment from the channel and inboard levee slopes when sediment accumulation exceeds 0.3 m (1 ft).

Vegetation Management. Bridge transition areas for all of the reaches would require special vegetation management treatment 30 m (100 ft) upstream to 30 m (100 ft) downstream from the bridge faces. All flexible vegetation would be removed and maintained so that the vegetation is less than 0.3 m (1 ft) in height. Established woody vegetation (willows and cottonwoods) located in bridge transitions will be maintained so that overhanging branches that are at or below 6 m (20 ft) above the channel invert and that are greater than 0.15 m (6 in) in diameter would be trimmed to maintain the flow way. New woody vegetation would not be permitted to establish in the bridge transitions. Two exceptions to the above maintenance guideline are required: (1) the I-880 downstream transition would be 91 m (300 ft) to reduce water surface elevations and (2) the Skyport Drive Bridge downstream transition would be 15 m (50 ft) to accommodate Corps mitigation plantings.

All vegetation obstructing maintenance roads, shall be removed. Vegetation that overhangs on maintenance ramps shall be cut to the edge of the maintenance roads up to the height of 6.7 m (21 ft).

Adaptive Management and Monitoring Program

Sediment removal during project construction would involve initial excavation in all of the sediment management areas. Periodic removal of sediment in Reaches B through E and Reach G will be gauged annually by District staff based on data collected as part of the proposed monitoring and adaptive management plan. Subsequent sediment removal will occur in alternating strips in various areas depending on the rate and location of sedimentation in these areas. In addition, sediment management buffer areas are identified for the low flow channel and riparian corridor where sediment management would be restricted.

Vegetation management will also be adjusted based on the adaptive management and monitoring program. The need for periodic vegetation removal in Reaches A through G will be judged annually by District staff based on vegetation growth rates and heights and application of maintenance guidelines.

This program will also require annual monitoring of the levees for settlement and seepage. Subsequent to a more detailed geotechnical evaluation of the preferred alternative, which will include borings, sampling and geotechnical testing, the design and frequency of this type of monitoring will be better defined.

During relatively large infrequent storm events Reaches B and C, characterized by freshwater hydrology, are anticipated to receive moderate volumes of gravel. Gravel, having a higher ability to remobilize during a flood event, may prevent the establishment of vegetation, thereby requiring less maintenance to preserve the capacity of the channel. Reaches D, E, and G, however, are expected to acquire silts on a daily basis due to the influence of tidal conditions. As a result, given the characteristics of silts to accommodate the establishment of vegetation, it is expected that Reaches D, E, and G would require more frequent scheduled maintenance to preserve the capacity of the channel.

Reach A, Highway 101 to I-880

Vegetation Management. Aggressive vegetation management in Reach A (I-880 to 120 m (394 ft) downstream from the bridge) is required to reach the target water surface elevation of 17.86 m (58.6 ft; NAVD 88) at I-880. This will involve regular cutting of vegetation to less than 0.3 m from the inboard levee hinge to inboard levee hinge as necessary. Overlapping SRA will not be disturbed.

The Corps mitigation area is subdivided into two planting areas: restricted and unrestricted (refer to Appendix D, Maintenance Guidelines, Figure D-3). The restricted mitigation planting area is approximately 4.5 m (15 ft) wide on either side of the low flow channel and begins 91 m (300 ft) downstream from I-880 and extends approximately 610 m (2,000 ft) downstream from I-880. In the restricted zone, all vegetation other than the mitigation plantings will be cut and maintained so that 80 percent of the vegetation is less that 0.3 m (1 ft) in height.

The unrestricted planting area and District SRA is approximately 4.5 m (15 ft) wide on either side of the low flow channel and begins at the downstream end of the restricted planting zone and extends to 30 m (100 ft) upstream of Airport Island Bridge. In the unrestricted mitigation planting areas and District SRA the only vegetation management permitted will be snag removal. Only snags that will impede flows and/or cause potential flooding will be removed.

Vegetation maintenance in the reach between the downstream end of the SRA and Highway 101 will involve periodic removal of flexible and woody vegetation from the overbanks and on inboard levee slopes. At inboard levee slopes, flexible vegetation will be cut to less than 0.3 m (1 ft) and would be re-cut when the vegetation exceeds 1 m (3 ft) in height. When woody vegetation recruits exceed 1.5 m (3 ft) they will be cut to less than 0.3 m (1 ft). Established woody vegetation (willows, cottonwoods etc.) located outside of mitigation planting areas will be maintained so that overhanging branches that are at or below 6 m (20 ft) above the channel invert and that are greater than 0.1 m (6 in) in diameter will be trimmed to maintain the flow way.

The Caltrans Mitigation planting bench extends along the east bank from Stations 17+430 to 16+682 and from Stations 15+630 to 15+550. Only snag removal will be permitted in the Caltrans mitigation bench.

Reach B, Trimble Road to Highway 101

Sediment Management. Selective sediment removal will occur in Reach B to maintain design capacity. Excluding a 6-m (19.7-ft) riparian buffer on either side of the low flow channel, sediment will be removed in the overbank areas. Sediments will be removed when they exceed 0.6 m (2 ft) average depth or when the accumulation of sediment reduces the 4.5 m distance below the levee crest to 3.9 m (12 ft). This sediment management was developed using 1992 aerial surveys. Connections from the excavated areas to the low flow channel will be provided to prevent fish entrapment. Details are provided in Appendix F.

Vegetation Management. Vegetation management within Reach B will involve periodic removal of vegetation from the overbanks and inboard levee slopes. On the channel invert and inboard levee slopes, flexible vegetation will be cut to less than 0.3 m (1 ft) and will be re-cut when the vegetation exceeds 0.9 m (3 ft) in height. When woody vegetation recruits exceed 1.5 m (5 ft) they will be cut to less than 0.3 m (1 ft). Established woody vegetation (willows, cottonwoods etc.) will be maintained so that overhanging branches that are at or less than 6 m (20 ft) above the channel invert and that are greater than 0.15 m (6 in) in diameter will be trimmed to maintain the flow way.

Reach C, Montague Expressway to Trimble

Sediment Management. An approximately 30-m (100-ft) wide overflow channel will be re-excavated on the East Bench. The overflow channel dimension will be measured from the edge of the depressed maintenance road (at the top of the channel elevation) towards the low flow channel. The overflow channel boundary near existing riparian vegetation will be set based on the plans and specifications for previous mitigation plantings in this reach to avoid removal of existing mitigation plantings. The channel will be excavated to an elevation equal to approximately 1 m (3 ft) below the depressed maintenance road elevation. It will then be re-excavated when sediment depth in the channel is greater than 0.6 m (2 ft) average below the depressed maintenance road elevation. Connections from the excavated areas to the low flow channel will be provided to prevent fish entrapment. Details are provided in Appendix F.

Vegetation Management. Vegetation management in this reach involves periodic removal of vegetation in a 30-m (100-ft) wide excavated overflow channel and inboard levee slopes. Flexible vegetation will be cut to a height of less than 0.3 m (1 ft) and will be re-cut when vegetation height is greater than 1.5 m (5 ft). Established woody vegetation in the excavated overflow channel will be removed when woody vegetation recruits exceed 1.5 m (5 ft) they will be cut to less than 0.3 m (1 ft). Height of vegetation on the depressed maintenance road will be maintained to less than 0.3 m (1 ft). Vegetation management within the riparian corridor will be limited to clearing of snags and debris. The existing mitigation planting area will not be disturbed.

Reach D, Hetch Hetchy Pipeline to Montague Expressway

Sediment Management. An approximately 10.6 m-wide (35 ft-wide) overflow channel will be re-excavated on the east and west overbank areas. The excavated channels will be measured from the edge of the depressed maintenance roads (at the top of the channel elevation) towards the low flow channel. A buffer area, minimum width of 15.2 m (50 ft) to a maximum width of 22.8 m (74.8 ft) will be provided from the low flow channel centerline to both the east and west overflow channels. The channels will be excavated to a depth of approximately 2 m (6 ft) measured from the depressed maintenance road elevation. Connections from the excavated areas to the low flow channel will be provided to prevent fish entrapment. Details are provided in Appendix F.

Re-excavation will occur when depth of new sediment exceeds 0.6 m (2 ft).

Vegetation Management. Vegetation management will involve removal of flexible and woody vegetation in the 10.6-m (35-ft) wide excavated channels and inboard levee slopes. Acceptable vegetation limits and standards are the same as identified for the Reach C overflow channel. Vegetation management in the 30.5-m (100-ft) to 45.7-m (150-ft) wide riparian buffer area will be limited to clearing snags and debris as necessary.

Reach E, Tasman Drive Bridge to Hetch Hetchy Pipeline

Sediment Management. An approximately 10.6 m-wide (35 ft-wide) excavated channel will be re-excavated on the east and west channel overbanks. The excavated channels will be measured from the edge of the depressed maintenance roads (at the top of the channel elevation) towards the low flow channel. A 30- to 45-m wide riparian buffer area that includes the low flow channel will be preserved. The channels will be excavated to a depth of approximately 2 m (6 ft) measured from the depressed maintenance road elevation and will be re-excavated when the sediment reaches a 0.6-m depth. Connections from the excavated areas to the low flow channel will be provided to prevent fish entrapment. Details are provided in Appendix F.

Vegetation Management. Vegetation management will involve removal of flexible and woody vegetation in 10.6-m (35-ft) wide excavated overflow channels on each overbank and inboard levee slopes. Acceptable vegetation limits and standards are the same as identified for the Reach C overflow channel. Vegetation management in the 30.5-m (100-ft) to 45.7-m (150-ft) wide riparian buffer area will be limited to clearing snags and debris as necessary.

Reach F, Route 237 to Tasman Drive

Sediment Management. No sediment management has been identified for this reach.

Vegetation Management. Vegetation management will require cutting or substantially reducing the standing crop of vegetation at the beginning of each flood season. Vegetation management will involve annual herbicide or mechanical control of vegetation from the overbanks and inboard levee slopes. With the exception of a 6-m (20-ft) buffer on either side of the low flow channel all vegetation will be cut to a height of 0.3 m (1 ft), thereby preserving the root mass. In the downstream transition of the Tasman Drive Bridge, 30.5 m (100 ft), all vegetation will be cut and maintained so that the vegetation is less than 0.3 m (1 ft) in height.

Reach G, UPRR to Route 237

Sediment Management. A 12-m section adjacent to the toe of the depressed maintenance roads will be dredged. A 6-m (19.7-ft) buffer will remain on both sides of the low flow channel to protect fish habitat. Connections from the excavated areas to the low flow channel will be provided to prevent fish entrapment. Details are provided in Appendix F.

Vegetation Management. The computed hydraulic performance of this reach is highly dependent on the aggressive removal of vegetation. Tules in the overbanks will be cut to 0.3 m (1 ft) in height as part of the initial construction of the project and kept at this height by maintenance. A 6-m (19.7-ft) buffer will remain on both sides of the low flow channel to protect fish habitat and herbicide treatment will be used to aggressively maintain vegetation in the overbank areas that are not maintained by the sediment removal activities.

The maintenance standards are summarized in Appendix D, Maintenance Guidelines, Tables D-1 to D-10.

6.2.7 Maintenance Roughness Values

The following gives a brief description of overbank *n* values that were assumed in each reach for the maintained conditions.

- *Reach A*: The *n* value corresponding to vegetation management is 0.04, except for 150 m (492 ft) downstream from I-880 where aggressive vegetation management occurs that has a *n* value of 0.03. The buffer zone lining the main channel containing single or multiple rows of trees has a *n* value of 0.10. Areas of designated Caltrans mitigation planting adjacent to State Route 87 have a *n* value of 0.10.

- *Reach B*: The *n* values corresponding to vegetation and sedimentation management are 0.04, while the natural buffer zone adjacent to the main channel has a *n* value of 0.08.

- *Reach C*: The *n* values corresponding to vegetation and sedimentation management are 0.04, while the natural buffer zone and riparian corridor adjacent to the main channel has a *n* value of 0.08.

- *Reach D*: The *n* values corresponding to vegetation and sedimentation management are 0.04, while the natural buffer zone adjacent to the main channel has a *n* value ranging from 0.08 at the upstream end to 0.20 at the downstream end. The buffer zone within this reach transforms from brush/tree vegetation at the upstream end to bullrushes at the downstream end.

- *Reach E*: The *n* values corresponding to vegetation and sedimentation management are 0.04, while the natural buffer zone adjacent to the main channel has a *n* value ranging from 0.20 at the upstream end to 0.25 at the downstream end. The buffer zone within this reach contains thicker bullrush vegetation progressing downstream.

- *Reach F*: The *n* values corresponding to vegetation management on the levee side slopes are 0.04, while the 6-m (19.7-ft) buffer zone and low-lying areas adjacent to the main channel has a *n* value of 0.05. The buffer zone within this reach contains unrestricted bullrush growth, while the low-lying areas contain bullrushes with vegetation management.

- *Reach G*: The *n* values in this reach are identical to Reach F.

CHAPTER 7
PROJECT COST, FUNDING, AND SCHEDULE

7.1 Project Cost

The total first cost of the recommended LGRP is estimated to be $60.58 million, in year 2000 dollars, including construction, final engineering design and construction engineering services. Right-of-way and mitigation costs are also included.

An estimate of the capital construction costs are summarized in Table 7-1. A breakdown of construction cost by reach is detailed in Appendix E (Cost Estimate Tables E-1 through E-8).

7.2 Project Funding

The project would be funded by existing revenues generated by the one percent property tax in the Central Flood Control Zone.

7.3 Project Schedule

Construction of all recommended flood protection improvements within District rights-of-way, in Reaches A through G plus the Baylands, will be included in one construction contract (No. 1). It is estimated that this work will be completed in 2 to 2 ½ construction seasons, beginning in August 2002.

A second, separate construction contract (No. 2) will include reconstruction of the eastbound State Route 237 Bridge, with all related highway mainline improvements within Caltrans rights-of-way. Channel improvements beneath the existing and new bridges and within state right-of-way will also be completed in this contract. This contract will complete all work identified in a Caltrans Encroachment Permit and its estimated duration is two (2) construction seasons. Construction is expected to begin in March 2003.

Table 7-2 shows the estimated completion dates for important project implementation milestones. All hydraulic-capacity-related improvements are anticipated to be in place in 2004, to accommodate completion of the Downtown Project and the Corps' LCA.

Table 7-1
Lower Guadalupe River Project
Summary of Recommended Alternative Capital Construction Costs

Reach	Limits	Proposed Flood Protection Measures	Total Cost (millions)
A	Interstate 880 Bridge to Highway 101 Bridge	Floodwalls/levee widening/ vegetation management	$4.64
B	Highway 101 Bridge to Trimble Road Bridge	Levee raising/floodwalls/ vegetation management/ sediment removal	$2.95
C	Trimble Road Bridge to Montague Expressway Bridge	Levee raising/floodwalls/ vegetation management/ sediment removal	$8.30
D	Montague Expressway Bridge to Hetch Hetchy Pipeline Crossing	Levee raising/ vegetation management/sediment removal	$6.98
E	Hetch Hetchy Pipeline Crossing to Tasman Drive Bridge	Levee raising/levee remediation/vegetation management/sediment removal	$8.84
F	Tasman Drive Bridge to Route 237 Bridge	Floodwalls/levee raising/levee remediation/vegetation management /bridge replacement	$17.78
G	Route 237 Bridge to UPRR Bridge	Floodwalls/levee raising/ vegetation management/ sediment removal	$6.45
Baylands	UPRR Bridge to Alviso Marina	Levee raising/weir	$4.64
		TOTAL	**$60.58**

Table 7-2
Lower Guadalupe River Project
Implementation Schedule Milestones

Item	Completion Date
Plans and Specifications	May 2002
Advertise Construction Contract No. 1[1]	May-June 2002
Begin Construction Contract No. 1	August 2002
Complete Construction Contract No. 1	December 2004
Advertise Construction Contract No. 2[2]	November-December 2002
Begin Construction Contract No. 2	March 2003
Complete Construction Contract No. 2	December 2004

[1] Construction Contract No. 1 includes recommended flood protection improvements within District rights-of-way in Reaches A through G, plus the Baylands.

[2] Construction Contract No. 2 includes reconstruction of the eastbound State Route 237 Bridge at Guadalupe River, with related highway and channel improvements within Caltrans right-of-way.

CHAPTER 8
CONCLUSIONS AND RECOMMENDATIONS

The existing flood carrying capacity of the Guadalupe River, between the UPRR Bridge and I- 880, is less than the design flow rate. This portion of the Guadalupe River must be improved to handle the design flow rate that will be conveyed to the project area upon completion of the Downtown and Upper Guadalupe River projects. A design flood flow on the Guadalupe River without completion of the Downtown Corps and Lower Guadalupe Projects would inundate approximately 3,273 residential units, 951 commercial and industrial properties, and 66 public structures. A total of approximately 4,290 buildings would be flooded, and total flood damages are estimated at $560 million.

The recommended project would provide protection to the community from the design flood and would accomplish most of the objectives of the District and community. The following are the beneficial impacts of the project:

- **Flooding:** Restores flood protection from the design flood (481.4 cms [17,000 cfs]). Improves flood protection in Alviso from Guadalupe River flood flows.
- **Maintenance:** Provides better access for maintenance and requires less intensive maintenance activity in the natural stream.
- **Erosion:** Repairs areas of active erosion, and protects banks from future erosion potential.
- **Sedimentation:** Removes 1.25×10^5 m^3 (1.63×10^5 y^3) of accumulated sediment from the Guadalupe River. Facilitates removal of future sediment.
- **Local drainage:** Decreases the duration and frequency of flooding in the streets and local ponding.
- **Water quality:** Decreases sediment and turbidity in water contributed from erosion of banks.
- **Levee stability:** Rehabilitates existing levees to current FEMA standards.
- **Riparian vegetation:** Mitigates impacts on site and on adjacent lands and maintains a continuous riparian corridor along the stream.
- **Wetlands:** Mitigates impacts on site and on adjacent lands.
- **Wildlife habitat:** Mitigates impact on site and on adjacent lands and maintains a continuous habitat corridor along the stream.
- **Fish habitat:** Mitigates impacts on site and on adjacent lands, maintains a continuous riparian corridor, and a continuous low flow channel.

- **Recreation:** Complements the City's and Valley Transportation Authority's park and trail master plan and allows for 9.65 km (6 mi) of future trail development that will connect downtown San Jose to the Alviso and Baylands areas.

Therefore, the recommended project should be approved and construction documents should be prepared for implementation of the project.

Appendix A

Appendix A
References

APPENDIX A
REFERENCES

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Appendix B

Appendix B

NHC April 2001 Supplemental Memorandum

March 2000 Draft - Existing Conditions Report

MEMORANDUM

northwest hydraulic consultants inc.

16300 christensen road, suite 350
tukwila, washington 98188-3418
(206) 241-6000
fax no. (206) 439-2420

DATE: April 17, 2001

TO: Dave Von Rueden, CH2M HILL

FROM: Bob Elliot, NHC

SUBJECT: Updated Guadalupe River HEC-RAS™ Baseline Model

This memorandum describes updates and revisions that have occurred to the Guadalupe River baseline HEC-RAS™ model since the March 2000 release of the Existing Conditions Report. The baseline model as described in that report along with the revisions herewith, represents the final baseline model. This model was used as the basis to analyze and compare the two final alternatives for the project: floodwall / levee raise and channel bank modification. Most of the revisions to the baseline model occurred within Reach A. For a more thorough discussion on the assumptions made in the Reach A modeling and comparison to SCVWD modeling of Reach A, refer to the October 19, 2000 memo from NHC to CH2M HILL, entitled, *"Reach A HEC-RAS™ assumptions and proposed solutions to achieve I-880 target water surface elevation"*.

Reach A

At the time the Existing Conditions Report was release, the modeling approach for SRA mitigation plantings had not been finalized. The latest model, as described in the previously mentioned report, specified composite overbank bench Manning *n* values of 0.10 and 0.05, respectively, for the unrestricted (multiple rows of trees) and restricted (single row) plantings. These *n* values represent the overbank bench, and do not include the main low-flow channel. Since then the *n* value for the restricted area plantings has been increased to 0.07.

Initially, mitigation activities for the Caltrans Guadalupe Parkway project (SR 87) were not to be included as baseline conditions, and were therefore not included in the Existing Conditions Report. Subsequently, the Caltrans mitigation has been added as a baseline condition, and this is reflected in the final baseline model. This consists of an excavated bench along the east levee slope of Reach A, from approximately Stations 16350 to 17400. Geometry for the excavated bench was incorporated into the baseline model from an existing model provided by the SCVWD, and was compared with and determined to accurately represent the final Caltrans plans. Plantings on the excavated bench were represented in the baseline model by specifying an *n* value of 0.10.

In an effort to better match the SCVWD model and results, two additional *n* value changes were made to the baseline model within Reach A. Between Highway 101 and the Parking Lot (Airport Island) bridge, *n* values were increased to 0.05. The main low-flow channel *n* value elsewhere (upstream of the parking lot bridge) was increased from the calibrated value of 0.027 to 0.037.

It should be noted that the baseline condition does not reflect the vegetation maintenance program as described in Chapter 6 of the Engineers Report. This is considered part of the alternatives, and will result in some reduction of *n* values along the overbanks. The baseline condition also does not include aggressive vegetation management just downstream of I-880, proposed as part of the alternatives to meet the target I-880 water surface elevation.

Proposed maintenance roads on both banks were also added to the Highway 101 and Airport Parkway Bridge cross sections, as per the Upper Guadalupe project. The Skyport and I-880 Bridge cross sections already reflected the maintenance roads, while the change to the parking lot bridge cross section is insignificant.

Other Revisions

The baseline discharge had previously varied from 481 cms (17,000 cfs) up to 566 cms (20,000 cfs), reflecting pumped inflows along the project reach. As specified by SCVWD, this has been modified in the baseline model to reflect only a constant 481 cms (17,000 cfs) throughout.

The junction in the model near Alviso depicting overflow to the Cargill ponds was redefined. The junction (with inline weir) allowed us to define an actual flow split and estimate via trial and error the actual overflow into the Cargill ponds. However, because the overflow was more or less depicted at a single cross-section junction point instead of distributed along the actual length of the overflow weir, this caused a discontinuity in the water surface profiles. To remedy this, the junction was removed. The flows were then reduced gradually at four cross sections along the length of the overflow section, based on external broad-crested weir overflows estimated (in a spreadsheet) for each sub-reach between cross sections. The total overflow was similar to the previous estimate with the junction, but the loss of flow is distributed more appropriately along the length of the overflow. This results in a smoother water surface profile in this vicinity.

Conclusion

Subsequent to release of the March 2000 Existing Conditions Report, further modifications have been made to the baseline HEC-RAS™ model and are described herein. Also subsequent to this report have been various review comments by SCVWD and Multech Engineering Consultants and responses to review comments by NHC and CH2M HILL.

In particular, we wish to summarize here one particular response by NHC dated December 7, 2000, to a review of the Baseline Conditions Report by Mr. R. Talley. This particular review and response specifically addresses design conditions assumed in the baseline model. The following key issues are addressed:

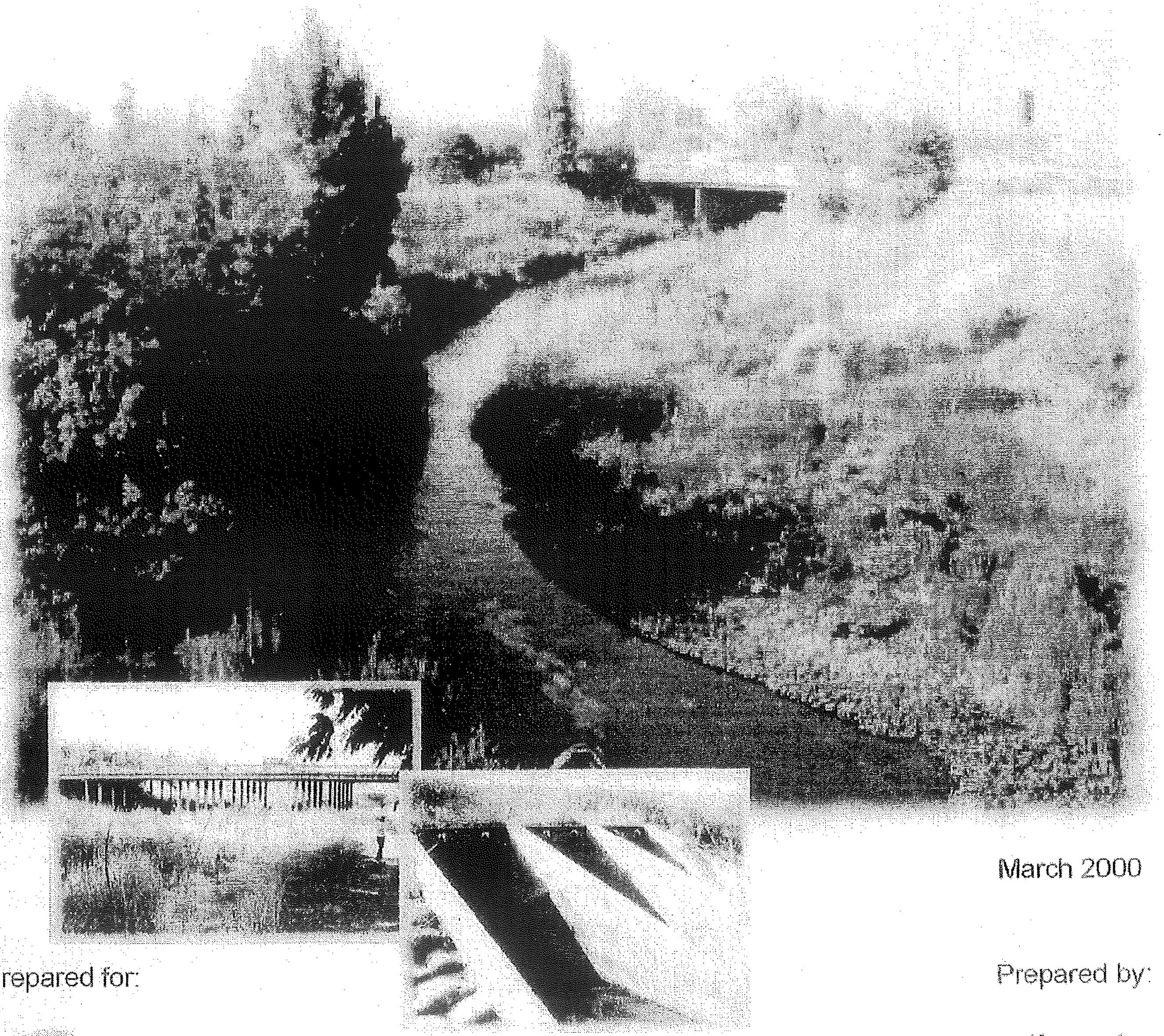
- Validation cross-section surveys by CH2M HILL confirm that SCVWD 1996 survey data are sufficiently accurate for the baseline model and current investigations. Known pipe, utility, and bridge crossings likely to affect river hydraulics have been incorporated into the baseline analysis.
- As per SCVWD, neither possible future land-subsidence nor sea level rises have been incorporated into the baseline condition, levee freeboard and project design. It has been recommended by NHC, however, that future rates of subsidence and sea level trends be closely monitored.

- Levee settlement is a significant design concern and will be included as part of the final alternative design consideration.
- The baseline model is specifically calibrated for high flow events. NHC recommends annual collection of high water profile data for a range of discharges, which will help provide an assessment of the project performance over time and allow the present models to be refined as conditions change in the future.
- Large overbank *n* values in the lower reaches of the Lower Guadalupe River represent the combined effects of both roughness and reduced conveyance area due to extremely thick bulrush and other vegetation. Recent research and literature support this approach, and the resulting calibrated model closely matches the observed water surface profiles.
- As per correspondence and directives by SCVWD, baseline conditions generally represent today's channel conditions (with the exception of future SRA and Caltrans mitigation proposed in Reach A). Except to the extent these are evident in today's channel, previous maintenance conditions such as outlined in R. Talley memos of 1991 and 1992, are not depicted in the baseline model. However, stream channel maintenance scenarios as specified in Chapter 6 of the Engineer's Report including the 1991 and 1992 maintenance recommendations and will be part of the LGRP long-term maintenance plan.

EXISTING CONDITIONS REPORT

HISTORY OF BASIN AND CHANNEL AND BASELINE HYDRAULIC EVALUATION

Santa Clara Valley Water District



March 2000

Prepared for:

CH2MHILL

Prepared by:

nhc northwest hydraulic consultants

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EXECUTIVE SUMMARY

The present Lower Guadalupe River channel cannot contain the design flood. If improvements are not made, major floods will overtop existing levees and inundate developed floodplain areas. The Santa Clara Valley Water District (SCVWD or Water District) is responsible for flood protection along the Lower Guadalupe River. In June 1999 the Water District retained a consultant team led by CH2M Hill to evaluate the capacity of the existing river channel and develop alternatives to prevent flooding during the design event. The study reach extends upstream from the UPRR (formerly SPRR) bridge near the community of Alviso to the Interstate 880 bridge near the south end of the San Jose airport, a distance of approximately 10,600 meters. Historically, portions of this reach have been straightened, enlarged, and confined between earthen levees to prevent flooding of valuable floodplain properties.

This report describes the results of the baseline hydraulic study. Results from the baseline study provide background information required to identify and understand factors contributing to the limited capacity of the existing channel. Understanding this information is required before appropriate alternatives can be developed to increase the system's capacity and satisfy the objectives of the design and ultimate project maintenance requirements. Northwest Hydraulic Consultants (NHC), a subconsultant to CH2M Hill, completed the baseline hydraulic study and prepared this report. The report is divided into two parts. Part 1 discusses the history of the river basin and channel, while Part 2 describes NHC's approach and results from a water surface profile computer model created to examine the capacity of the existing channel and evaluate the performance of proposed flood protection alternatives.

Information presented in Part 1 is taken primarily from previous investigations and published literature. In January 2000, NHC completed a comprehensive sediment engineering investigation for the Lower Guadalupe River between San Francisco Bay and Interstate 880. The study was completed for the Water District under a contract separate from this project. The sediment study report contains a thorough review of the geomorphic history of the basin and channel and describes the primary factors that have influenced channel capacity. These include both natural and man-induced factors such as: land subsidence due to groundwater withdrawal, rising sea levels, changes in basin land use, sediment accumulation, bridge constructions, and aggressive growth of in-channel vegetation. All of these contribute to decreasing channel capacity with time and to increasing the annual Water District maintenance requirements.

Part 2 of the report describes NHC's approach for assessing baseline hydraulic conditions, summarizes the design flood flow rates, and discusses the development of a HEC-RAS water surface profile model of the project reach. The design flood flow rates were prescribed by the Water District and are described in Directive No. 1 in Appendix A. At the upstream end of the study reach, at Interstate 880, the design discharge corresponds to the U.S. Army Corps of Engineers published 100-yr flow rate of 17,000 cfs (481.4 cms). This is the same discharge used by the Corps to design the Downtown Guadalupe River flood protection project which begins at Interstate 880 and extends upstream to Interstate 280. In Directive No. 1, the Water District increases the design discharge incrementally downstream to account for flow contributions from

storm water pump stations. At the downstream end of the project reach -- the UPRR bridge -- the design discharge is 20,000 cfs.

An "Existing Conditions" HEC-RAS model was created from an existing HEC-2 model of the project reach. The HEC-2 model, developed by NHC for the earlier sediment study, was itself developed from a series of sub-reach HEC-2 models initially constructed by the Water District. The channel geometry in these models is based upon 1996 topographic maps and field surveys prepared by the Water District. NHC calibrated the HEC-RAS model to reproduce flood levels observed during the March 1995 flood of record. This calibration was verified by reproducing a January 1995 flood profile. The calibrated model should only be used for floods that exceed about 8,000 cfs. Below this, the model is likely to underestimate water levels because the influence of vegetation resistance increases significantly as flow depth decreases.

The HEC-RAS model confirmed that the existing channel cannot contain the design flood. Design water levels overtop the levees between the UPRR bridge and Trimble Road. Between Trimble Road and Highway 101, design water levels are lower than the levees although not by enough to satisfy freeboard requirements. Upstream from Highway 101, the amount of freeboard continues to increase. At the downstream side of Interstate 880, the predicted design water surface elevation is lower than a target elevation of 17.86 meters required by the Water District (see Directive No. 5, Appendix A). Pressure flow conditions exist during the design event at all bridges from Gold Street through Highway 101, inclusive. Overtopping conditions exist at two bridges: upstream (east bound) Highway 237 and Montague Expressway. The baseline HEC-RAS model includes the U.S. Army Corps of Engineers SRA plantings, but does not include the Caltrans Interstate 87 mitigation (as originally specified in Directive No. 3, see Appendix A).

The HEC-RAS model quantifies the overall capacity of channel sub-reaches, without regard to freeboard or to future changes in vegetation, roughness, or sediment accumulation. Between the UPRR bridge and Highway 237, incipient overtopping (capacity) of the existing levees corresponds to approximately 17,000 cfs (481.4 m^3/s). Above Highway 237 and upstream to Montague Expressway, the channel capacity drops to approximately 14,000 cfs (396.4 m^3/s), although there are some sections in this reach capable of passing up to approximately 15,500 cfs (438.9 m^3/s). Channel capacity gradually increases from Montague upstream to Highway 101. Just above Montague the capacity is about 15,000 cfs (424.8 m^3/s), at Trimble about 20,000 cfs (566.3 m^3/s), and below Highway 101 exceeding 23,000 cfs (651.3 m^3/s). Just above Highway 101 the channel capacity drops to about 18,500 cfs (523.9 m^3/s), due mainly to head losses through the Highway 101 bridge, then increases with distance upstream to about 23,000 cfs (651.3 m^3/s) at Airport Parkway. Capacity upstream of there to Interstate 880 exceeds 23,000 cfs.

The results presented herein are based on modeling calibrated to the March 1995 event. Because of possible changes that may have occurred to vegetation, roughness, and sediment accumulation since 1995, NHC strongly recommends high water surface profile data be collected during the year 2000 runoff season. It is recommended that high peak profiles as well as both intermediate (4,000 to 8,000 cfs) and low (less than 2,000 cfs) profile data be collected. This will allow development of dependable model parameters for the full range of expected flow conditions (from 2-year to 100-year).

INTRODUCTION

Flood protection improvements are needed along the Lower Guadalupe River to safely convey the design discharge through the northern sections of the Cities of San Jose and Santa Clara, California. Located between San Francisco Bay and downtown San Jose, the Lower Guadalupe River receives runoff from a 160-square mile drainage basin comprised of a steep upper watershed and a highly urbanized valley floor (Figure 1). This study examines the reach of the Lower Guadalupe River that extends upstream from the UPRR (formerly SPRR) bridge near the community of Alviso to the Interstate 880 bridge near the south end of the San Jose airport, a distance of approximately 10,600 meters (Figure 2). This stretch of the river will be referred to as the project reach. Presently, flood protection is provided along the project reach continuous parallel earthen levees. However, for the current channel condition, the levees are generally too low and will be overtopped during the design discharge. The levees were originally built in 1963, but sections were raised in the 1980s and 1990s. No other major flood protection features are present along the project reach.

Previous studies by and for the Water District have revealed that the existing flood control levees are too low to safely convey the design discharge for present channel conditions. A recent study by NHC for the Water District confirmed the lack of channel capacity and identified the following as the key physical features and processes that affect flood conveyance: local geology, regional seismology, tidal processes, subsidence, a rising sea level, changes in land use in the watershed and on the floodplains, urbanization, channel improvement projects upstream of Interstate 880, sediment accumulation from tidal and river processes, bridge constrictions and aggressive encroachment of in-channel vegetation (NHC, 2000).

The Water District is responsible for providing flood protection along the project reach. On June 30, 1999 the Water District retained CH2M Hill and their team of consultant experts to develop a flood protection plan to convey the design discharge through the project reach. The CH2M Hill team was also authorized to develop and evaluate maintenance activities that will increase channel capacity in the interim period 2000-2001, before the preferred flood protection project is constructed in 2002. CH2M Hill was also retained to complete a reconnaissance level engineering investigation to identify potential sources of flooding in the community of Alviso and identify environmental impacts that Guadalupe River flood protection projects may have along Alviso Slough and the neighboring salt ponds. Alviso Slough extends downstream of the project reach and is a continuation of the Lower Guadalupe River and extends approximately 7,000 meters from San Francisco Bay to the UPRR bridge, the downstream end of the project reach.

This existing conditions report presents the results of the hydraulic baseline engineering study. Northwest Hydraulic Consultants (NHC) completed the study and prepared this report. The purpose of the study was to gain an understanding of the features and the processes that have led to the present channel condition. It is also to develop the numerical modeling tools needed to evaluate flood control alternatives.

The report is divided into two parts. Part 1 discusses the history of the basin and river as well as the processes that have influenced channel capacity. Part 2 describes the analytical approach and results from the development of the HEC-RAS water surface profile computer model that was created to examine the project reach and also discusses the existing capacity of the channel.

PART 1 – HISTORY OF BASIN AND CHANNEL

1.0 Sources of Data and Information

The information presented in Part 1 is taken mainly from two existing reports -- a sediment engineering study completed by NHC for the Santa Clara Valley Water District in January 2000 and a watershed planning study completed by the Water District in January 1997 (NHC 2000, SCVWD 1997). The NHC report describes the results of a detailed sediment engineering investigation of the Lower Guadalupe River between San Francisco Bay and Interstate 880. It contains a thorough description of the history of geologic and geomorphic processes that have affected the river's ability to convey flood water. The Water District's planning study for the Lower Guadalupe River contains useful information including descriptions of past flooding problems and maintenance activities.

In addition to these reports, the Water District, CH2M Hill, and the other team members provided a variety of information used for the baseline study. These included historic flood high water mark data, topographic maps, bridge plans, agency contacts, and much more. The Water District provided the CH2M Hill team with five written directives to provide direction on how to proceed with certain project activities. They are identified below and attached in Appendix A:

Directive #1 – Design Flow Rates

Directive #2 – Hydraulic Model Selection

Directive #3 – Projects to Include in Baseline Conditions

Directive #4 – Cumulative Environmental Effects Analysis for the Bay Lands Area Only

Directive #5 – Hydraulic Integration with Downtown Project

2.0 History of Geologic and Geomorphic Changes

2.1 Characteristics of the Watershed and Project Reach

Located in Santa Clara County, the Guadalupe River basin covers an area of approximately 160 square miles. The river originates in the Santa Cruz Mountains, located southwest of San Jose, and drains northly through the heavily populated Santa Clara Valley and into San Francisco Bay (Figure 1). Major tributaries of the Guadalupe River are Alamitos Creek, Canoas Creek, Ross Creek, and Los Gatos Creek. Basin relief is approximately 3,800 feet, with the highest point near Loma Prieta in the Santa Cruz Mountains and the lowest point near Alviso at San Francisco Bay.

Hydrology of the watershed has been greatly altered by human activity. The upper watershed is regulated by several reservoirs (Table 1) and the lower watershed is almost entirely urbanized.

Table 1
Reservoirs Located in Guadalupe Drainage Basin

Reservoir Name	Basin Area Above reservoir (sq. mi.)	Year Built	Original Capacity (acre-ft)	Current Capacity (acre-ft)
Lexington	37	1952	20,200	19,830
Guadalupe	6	1935	3,700	3,230
Almaden	12	1935	1,800	1,550
Calero	8	1935	10,160	10,050

Combined, the four reservoirs cover a sub-basin area of 63 square miles, almost 40% of the watershed, and have a storage capacity of approximately 35,860 acre-ft. This capacity is used primarily for water supply, with some flood control benefits, although none of the reservoirs are operated for flood control purposes in the wet season. The non-regulated area of the watershed in Santa Clara Valley is largely urbanized and the Guadalupe River and its tributaries have been extensively channelized and leveed. Near the community of Alviso land use changes abruptly from densely urbanized municipal and residential areas to salt ponds and tidal marsh.

The Lower Guadalupe River between San Francisco Bay and Interstate 880 can be divided into two distinct sub-reaches -- tidal and non-tidal. The tidal reach extends upstream from the Bay to approximately the Montague Expressway (12,000 meters) and the non-tidal reach extends from Montague to Interstate 880 (5,600 meters) (Figure 3). As the Guadalupe River enters the tidal zone, where its elevation is within the zone of influence of Bay tides, its slope abruptly shallows causing a decrease in sediment transport capacity that results in significant gravel deposition between Trimble Road and Montague Expressway. The tidal reach exhibits a continued reduction in channel slope with distance downstream and is characterized by tranquil low flow conditions with fine to very fine-grained bed and bank material. Typical cross-sections show relatively flat, narrow strips of tidal marsh bordering the low flow channel, particularly downstream of Tasman Drive, whereas upstream sections have more irregular topography. The non-tidal reach exhibits channel invert elevations above tidal influences and a steeper channel slope with higher energy conditions, reflected by the gravel bed material of the low flow channel, small gravel bars, and occasional steep, eroded banks such as those observed upstream of the Airport Parkway bridge.

Vegetation is also affected by tidal conditions. In fresh water areas upstream of Montague Expressway, riparian woodland consisting largely of willow, cottonwood, and box elder is dominant. Fresh water marsh is found from Montague to the Hetch-Hetchy crossing, characterized by abundant bulrushes, areas of cattails along the channel bottom and decreasing riparian tree cover. Levee banks are covered by weeds and grasses and occasional brush. Salt marsh species become increasingly apparent downstream of Hetch-Hetchy, where cord grass and pickleweed compete with freshwater marsh species. Few, if any, trees are present in this area. Downstream of Tasman Drive, salt water species dominate and trees are absent.

2.2 Geology

2.2.1 General

The Santa Clara Valley is located in a structural depression of the Coast Range that has slowly infilled with sediments, creating a broad alluvial valley floor with deposits several tens of meters thick (Norris and Webb, 1990). A detailed discussion of deposits and sedimentary characteristics in the Santa Clara Valley is provided by Helley and Lajoie (1979).

Rock types vary within the Guadalupe River basin. In the upper basin they consist primarily of sedimentary rocks of the Franciscan Complex. They are highly sheared and faulted, typical of the Coast Range mountains. In the lower valley floor the materials are composed of Quaternary alluvium, some of it partially consolidated (Figure 4). In South San Francisco Bay and Guadalupe River estuary the materials are fine-grained bay muds.

The San Andreas Fault borders the western edge of the basin and the Hayward and Calaveras Faults lie to the east. Numerous other unnamed faults also cross through the basin (DMG, 1992), all of them in a SE - NW orientation that follows the structural alignment of the Coast Range.

2.2.2 Land Subsidence

Santa Clara Valley has experienced regional land subsidence since at least 1906 (Figures 5 and 6). Much of this subsidence is attributed to large-scale groundwater withdrawals that occurred prior to 1965, the year that state water deliveries began to arrive in the San Jose area. Subsidence and ground water table measurements from 1906 to 1995 reveal this trend (Figure 5). Figure 5 shows that almost all of the 14 feet of subsidence measured in downtown San Jose occurred from 1906 to 1965. Since then, the ground water table has reversed its downward trend and about 1 foot of additional subsidence has occurred.

Figure 6 shows that land subsidence along the Guadalupe River has not been uniform, at least for the period 1934 to 1967 (Poland and Ireland, 1968). Subsidence was at a maximum in San Jose at 8 feet (from 1934 to 1967) and lessened with distance outward, approaching 3 feet at the mouth of the Guadalupe River. Land subsidence has altered the bed slope of the Guadalupe River throughout the affected area. Subsidence of the downstream-most portions of the study area has contributed to recent dramatic land encroachment of tidal processes extending to about Montague Expressway.

2.2.3 *Sea Level Rise*

Throughout the last 10,000 years, the Guadalupe River has adjusted to consistently rising sea levels (Figure 7). Figure 7 shows that mean sea level has risen more than 40 meters during this period. Much of this rise occurred between 7,000 and 10,000 years ago, coinciding with glacial retreat of the last ice age (Atwater et al., 1977). For the past 6000 years, the trend line in Figure 5.3 shows a steady, gradual rise in sea level of 0.1 to 0.2 cm per year, indicating that it will continue to rise into the future. This suggests that sea level will be about 10 to 20 cm (0.4 to .8 ft) higher in 100 years, at the end of the design life of the lower Guadalupe River project. Increases in sea level will result in more extensive landward encroachment of tidal processes (water surface elevation, bay mud deposits and salinity) in the downstream end of the project reach.

2.3 Geomorphology

The lower Guadalupe River exists today as a managed floodway. The natural river channel has been straightened and confined by levees, giving it a relatively simple and consistent cross-sectional geometry that is narrower and deeper than the original stream condition. Historical changes to the channel planform, longitudinal profile, and cross section are described below.

2.3.1 *Changes in Channel Planform*

Five historical planform channel locations are compared in Figure 8. The channel alignments were obtained from maps prepared between 1857 and 1996 and identified in Table 2.

Figure 8 reveals that the natural river planform has been modified significantly to create a managed floodway. Prior to levee construction in 1963, the river channel was more sinuous and exhibited several meander bends, particularly downstream of Tasman Drive. These meanders appear to have been fairly stable prior to 1963 that may be due in part to the composition of the channel banks. Field observations suggest that the bank materials are a fine-grained silt and clay that may have some erosion resistant properties. Private levees and river training may also have contributed to channel stability in this area during this period.

Table 2
Mapping Examined for Lower Guadalupe River Study

Year Published	Year Planform Data Collected	Title	Source	Scale	Contour Interval	Comments
1870-1875	1857 – 1865	Rancho Ulistac, Rincon de los Esteros	U.S. Surveyor General	variable	N/A	Planform only, no contours
1953	1948	Milpitas, San Jose West	U.S.G.S. Quad Sheets	1:24,000	5 feet	no in-channel topography below water surface
N/A	pre-1963	Lower Guadalupe River Project, Alviso to I- 880	Santa Clara Valley Water District	1"=300'	N/A	Planform only, no contours
1980	1979	Milpitas, San Jose West	U.S.G.S. Quad Sheets	1:24,000	5 feet	no in-channel topography below water surface
N/A	1983 – 1996	Lower Guadalupe River Project, Alviso to I-880	Santa Clara Valley Water District	1"=300'	N/A	Planform only, no contours

In 1963 the levees were constructed along most of the project reach and portions of the river were straightened. Levee construction eliminated the opportunity of high flows to spread onto adjacent floodplain, thereby increasing the effective unit discharge carried by the river for various frequency events. In 1983, sections of levee were realigned and/or raised 0.3 m to 2.4 m, depending on location. In 1995, levees were raised again from the UPRR bridge to Highway 101 by 0.3 to 0.9 m as an emergency measure to provide added conveyance and freeboard. Both the 1979 and 1983-1996 channel alignments in Figure 8 show that the leveed flood control channel generally follows the trend of the historic alignment of the Guadalupe channel, though many of the smaller bends were straightened. Overall, levee construction both straightened and steepened the reach, reducing reach length from the UPRR to Interstate 880 by approximately 25%.

Downstream of Alviso at the north end of the project reach, channel patterns have changed dramatically from their original alignment (Figure 9). At the turn of the century, the tidal zone downstream of Alviso was characterized by a complex distributary channel flow pattern, one in which the number of flow channels increase with distance downstream. Presently, levees confine the flow to a single channel, Alviso Slough, flowing from Alviso to San Francisco Bay.

2.3.2 Changes in Channel Invert

Since significant levee modifications were made to increase flow capacity in 1983, the lower Guadalupe River has shown a general decline in elevation of the invert profile, most notably downstream of Trimble Road (Figure 10). Although some of this decline can be attributed to land subsidence (1 foot or less) during this period, a comparison of channel cross-sections from 1983, 1987 and 1996 shows that the majority is the result of deepening of the low flow channel (NHC 2000).

Because of significant land subsidence in the 1960's and prior, it is not possible to reliably correlate invert elevations from the original 1963 construction plans with 1983 and 1996 data. However, the influence of historic land subsidence on the river channel can be assessed by plotting a profile of land subsidence from Figure 5 along the channel invert (Figure 11). Figure 11 shows that historic land subsidence along the study reach varied from 0 to 8 feet from 1934 to

1967. Given that this period is roughly half that of total land subsidence (see Figure 5), the total is probably closer to double this value. Because the center of maximum subsidence is located upstream of Interstate 880, the river downstream has experienced an overall reduction in channel slope whereas the reach upstream of Highway 880 has experienced an increase. In general, river reaches where slope is reduced tend to exhibit a trend toward decreased stream energy with less bed and bank erosion and greater potential for stream aggradation, whereas river reaches that are steepened tend to show an opposite trend. Identification of these trends on the Guadalupe River cannot be made however, because of artificial channel changes made during levee construction in 1963, immediately following the period of historical land subsidence.

2.3.3 Changes in Channel Cross-Section

Between 1983 and 1996 there is evidence that the channel has increased in size upstream from Trimble Road due to erosion and has decreased in size downstream due to sediment deposition. For the previous sediment investigation by NHC (2000), cross sections surveyed in 1983/87 were compared with cross sections measured in 1996. The 1983 sections are between Gold Street and Airport Parkway, the 1987 sections between Airport Parkway to Interstate 880, and the 1996 cover the entire reach. The 1983 and 1987 cross-section data were obtained from the U.S. Army Corps of Engineers (USCOE, 1989) and 1996 data were obtained from the Water District. All data were converted to NAVD88, where applicable, using the relation $Elev_{NAVD88}$-$Elev_{NGVD29}$=0.81m. In general, the 1996 cross-sections exhibit a more well-defined low flow channel as well as aggradation along the channel banks when compared to 1983/87. This is particularly well illustrated in the tidally influenced zone downstream of Tasman Drive (Figure 12). In addition, almost all of the lateral bench (aggraded bank) deposits located downstream of Tasman Drive exhibit a nearly constant surface elevation from 2.25 and 2.75 m. This consistency of the lateral bench elevation is clearly related to tidal processes and defines an equilibrium elevation for sediment accumulation and the development of marginal marsh features within the leveed channel system.

The difference in cross-sectional area from 1983/87 to 1996 for all stations was calculated to identify sites of overall erosion or deposition. Area differences were extrapolated between cross-sections using the end-area method to calculate volumetric changes along the river. The results are shown in Figure 13 where the continuous line shows the cumulative volume difference (1983 minus 1996) with distance downstream from Interstate 880. This line is negative for areas of net erosion and positive for areas of net deposition. The dashed line shows the net deposition per channel length. Thus, where this line trends down it indicates net erosion whereas an uptrend indicates net deposition. Examination of the cumulative volume difference trend line in Figure 12 shows overall erosion from 1987 to 1996 occurring upstream of Trimble Road. The volume difference trend line rises above zero at Trimble Road and continues to climb with distance downstream, indicating net deposition from Trimble Road to Gold Street. While the volume difference line indicates general trends, the deposition per channel length line reveals local variability in deposition and erosion for shorter reach lengths.

2.4 Current and Future Trends

2.4.1 Land subsidence, Sea Level Rise, and Seismicity

The processes of land subsidence, sea level rise, and deepening of the channel invert all contribute to an overall lowering of the Guadalupe River relative to sea level. This will result in upstream migration of the tidal zone as well as vertical accretion of the tidal marsh over time. Although land subsidence has reduced dramatically since the early 1960's, it has continued in San Jose at a rate of .05 feet per year since 1975 (see Figure 5). Assuming this rate remains constant for the next 100 years, the design life of the project, then 5 feet of additional land subsidence could be expected to occur. In addition, assuming sea level will continue to rise at an approximate rate of .1 to .2 cm per year (see Figure 7), then the 100-year total sea level increase will be on the order of 0.4 to 0.8 feet. Combined, land subsidence and sea level rise yield a cumulative drop in channel elevation relative to sea level of 5 to 6 feet (1.5 to 1.8 m) at San Jose in 100 years. Given that land subsidence has not been uniform historically (see Figure 6), this decline is likely to be less with increasing distance downstream from San Jose. Thus, given the likelihood for continued subsidence and sea level rise, general aggradation and a reduction in channel capacity of tidally influenced areas of the Guadalupe River is anticipated. In addition, vegetation changes can also be expected to occur with upstream migration of the tidal zone.

The San Francisco Bay region is one of the most seismically active areas in North America. Thus, the potential for earthquakes to cause geologically based channel changes is high. Earthquakes can cause significant lateral and/or vertical coseismic adjustment of the ground surface. Liquefaction effects associated with ground shaking may also be produced in fine-grained tidal deposits or areas of loose, unconsolidated fill. This may cause localized settling of channel levees as well as redistribution of in-channel bed and bank sediments along the Guadalupe River.

2.4.2 Channel Cross-Section and Sedimentation

As shown in Figure 13, the lower Guadalupe River is generally aggrading downstream of Trimble Road. Two significant morphologic features are almost always present in this reach. First, there is the development of a well defined low flow channel. Second, there is aggradation of the channel banks, forming bench deposits that border the low flow channel (see Figure 12). The tendency for the river to adopt this type of cross-section should be considered as part of any channel modification plan for this section of river. Channel alterations that diverge significantly from this morphology will require more upkeep and maintenance than do plans that incorporate the natural tendency of the river system.

Conversely, areas upstream of Trimble Road tend to show general erosion with time (see Figure 13), due largely to a steeper channel profile. These areas also show a consistent trend toward development of a low flow channel, similar to areas downstream, but show greater erosion rather than aggradation of the channel banks. Some forms of biotechnical channel invert stabilization may need to be considered for this reach.

One of the primary objectives of the sedimentation study recently completed by NHC for the Water District was to determine if sediment will accumulate in the project reach and weather this will increase design water surface elevations. To evaluate this, NHC constructed a HEC-6T computer model of the project reach which allows for the computation of future long term sediment trends. The results suggest that without regular sediment maintenance, over the next 100 years the long term accumulation of watershed derived sediments in the reach between Interstate 101 and the Montague Expressway may increase the 100-yr flood stage 5 to 7.5 ft (1.5 to 2.3 m) (see Figure 14). This, assuming the levees are high enough to contain the flow. As noted previously, this reach is a natural location for sediment to accumulate due to the reduction in channel slope and flow velocity. Downstream from Tasman only slight increases in the design water surface elevation are expected as the result of river sediment deposition, on the order of 1 ft or less over the next 100 years (Figure 15). As shown in Figure 16, mean tide levels have been increasing over the past 150 years, and at a somewhat increased rate since 1920. However, even since 1920 the average increase in tide has only been approximately 0.007 ft (2 mm). Therefore, increases in the design water surface elevation due to tidal processes are also expected to be minimal (Figure 16).

3.0 Historical Flooding Problems

The project reach has not experienced any significant out of channel flooding problems since the levees were constructed in the 1960s and subsequently raised in the 1980s and 1990s. Since 1940, there have been ten noteworthy floods (see Table 3), the largest occurring on March 10, 1995 (SCVWD, 1997). The USGS estimated the instantaneous peak discharge of the March 1995 flood to be 11,000 cfs at the Guadalupe River gaging station downstream from Los Gatos Creek. This corresponds to a recurrence interval of about 30 years according to flood frequency estimates published by the U.S. Army Corps of Engineers (USCOE, 1977) (see Part 2 Section 3 of this report).

Table 3
Guadalupe River – Notable Peak Flows during past 60 Years

Date	Discharge United States Geological Survey Gage Downstream of Los Gatos Creek, m^3/s (cfs)	Estimated Frequency* (years)
February 27, 1940	246 (8,680)	18
February 2, 1945	187 (6,600)	10
January 12, 1952	227 (8,000)	14
April 2, 1958	259 (9,150)	20
February 19, 1980	224 (7,910)	13
March 31, 1982	208 (7,340)	12
January 24, 1983	202 (7,130)	12
February 18, 1986	259 (9,140)	20
January 9, 1995	263 (9,290)	19
March 10, 1995	312 (11,000)	29

* Based upon Corps of Engineers published hydrology

4.0 Summary Part 1

In summary, the following were important points of the history and future trends of the basin and river:

- The Guadalupe River basin has undergone tremendous land use changes since the turn of the century, including dam and reservoir construction in the upper watershed, urbanization of Santa Clara Valley, and river training and levee construction along all major streams.

- Geology of the upper Guadalupe River basin is characterized largely by sedimentary rocks of the Franciscan Formation, volcanic and ultramafic rocks, sandstone, and alluvium. These rocks are deeply faulted and fractured and bordered to the west by the San Andreas Fault and to the east by the Hayward and Calaveras Faults.

- Historically active fault systems have a high likelihood of causing coseismic adjustment to the Guadalupe River basin within the design life of the project. Historically, coseismic adjustment is thought to have contributed to channel plan and profile adjustments elsewhere along the Guadalupe River.

- The lower Guadalupe River is affected by sea level rise which continues to occur at an estimated rate of 0.1 to 0.2 cm per year. Similarly, the Santa Clara Valley is affected by differential land subsidence, occurring at a rate of 0.05 feet per year in San Jose. If both sea level rise and land subsidence continue, then upstream migration of the tidal zone is expected to cause tidally induced aggradation.

- Levee construction in 1963 reduced channel length by 25%, mainly in the area downstream of Tasman Drive where several historic meanders were present. Levees also eliminated the former distributary flow pattern of the Guadalupe River downstream of Alviso and the ability of high flows to spread onto adjacent floodplains upstream of Alviso.

- The tidal reach of the project reach (UPRR to Montague Expressway) is a depositional environment, characterized by low slope, low energy conditions with a well-defined low flow channel and aggraded channel banks. Bed and bank material consists primarily of silt and clay.

- The non-tidal reach (Montague Expressway to Interstate 880) exhibits greater channel slope and higher stream energy, as well as both erosional (e.g. Interstate 880 to Airport Parkway) and depositional zones (e.g. Trimble to Montague). Bed and bank material consists largely of sands and gravels.

- A comparison between 1983 and 1996 channel geometries shows general declines in invert elevation of 0 to 2.5 m, primarily downstream of Trimble Road. This is mainly due to localized incision of the channel invert rather than general bed degradation.

- Volumetric comparisons made from 1983/87 and 1996 cross-section data show general erosion to have occurred from Interstate 880 to Trimble Road, whereas deposition occurred from Trimble Road to UPRR. This deposition almost always occurred in the form of aggrading and widening channel banks that encroached the channel. The tendency for the river to adopt this type of cross-section should be considered as part of any channel modification plan for this section of river.

- Without regular sediment maintenance over the next 100 years, accumulation of watershed derived sediments in the reach between Interstate 101 and the Montague Expressway may increase the 100-yr flood stage 5 to 7.5 ft (1.5 to 2.3 m). Downstream from Tasman only slight increases in the design water surface elevation are expected as the result of river sediment deposition and tidal processes.

PART 2 – BASELINE HYDRAULIC EVALUATION

1.0 Approach

A HEC-RAS water surface profile computer model was created for the project reach (see Figure 2) to evaluate the capacity of the existing system and evaluate the potential benefits of flood protection alternatives. Part 2 of this report describes existing flood protection features along the project reach, hydrology of the system, and the development of the HEC-RAS model. Evaluation of flood protection alternatives is not addressed in this baseline existing conditions report, as this will be done in a future document.

Two HEC-RAS models were created for the project reach. The first model represents the physical characteristics of the project reach that were present in 1996. This is the most recent date for which channel geometry data are available and is just a year after the flood of record occurred that was used for model calibration. The second "Baseline" model was also developed. It is identical to the 1996 model but includes the new Skyport Bridge (this bridge did not exist in 1996) and a future vegetation planting plan commonly referred to as the Corps' Reach A SRA mitigation planting. The SRA (shaded riverine aquatic) habitat has not been installed but has been approved and should be planted soon. The Baseline model represents the current channel condition and was used to estimate the existing capacity of the project reach with no further channel or levee improvements.

The HEC-RAS model cross-sections are oriented facing in a downstream direction. As such, all references in this report to the "left" or "right" (levees, overbank, etc) are also with respect to a downstream-facing orientation.

2.0 Flood Protection Features

Presently, flood protection is provided along both banks of the river by continuous parallel earthen levees that extend along the entire project reach. However, for the current channel condition, bridge constrictions and low levees contribute to possible breakout flows during the design discharge. The levees were originally built in 1963, but sections were raised in the 1980s and 1990s. No other major flood protection features are present along the project reach.

3.0 Hydrology

Hydrology published by the U.S. Army Corps of Engineers (USCOE, 1977) includes storm frequencies and associated peak discharge rates shown in Table 4 in both metric (System International) units and English units.

Table 4
Lower Guadalupe River Flow-Frequency Relationship

Event Frequency (USCOE, 1977)	Instantaneous Peak Discharge (m^3/s)(A)	(cfs)(B)	Comment(s)
2-year	65.14	2,300	
5-year	127.44	4,500	
10-year	189.74	6,700	
25-year	283.20	10,000	
Approx. 30-year	311.52	11,000	10 March 1995 Storm Event
50-year	382.32	13,500	
100-year	481.39	17,000	

(A) – units are cubic meters-per-second (B) – units are cubic feet-per-second

These values represent discharges on the Guadalupe River downstream of Los Gatos Creek (near downtown San Jose) and are prescribed by the Water District at Interstate 880. They are assumed to include local drainage inflows from city/county pump stations discharging into the Guadalupe River at various points. Figure 17 depicts the Corps' flow-frequency relationship, and also includes peak data collected at the downtown San Jose streamflow gaging station (USGS gage 11169000) during the period 1930 to 1995. Figure 18 shows Guadalupe River annual instantaneous peak discharges at the San Jose gaging station for 1930 through 1997. The mean annual instantaneous peak discharge for this period is approximately 3,479 cfs (98.53 m^3/s). It is worth noting that this mean *annual* peak discharge from the USGS gaging record is 1.5 times greater than the Corps' (published in 1977) *2-year* peak discharge of 2,300 cfs. Furthermore, the March 1995 record flood discharge of 11,000 cfs (311.52 m^3/s) plots as a 70-year recurrence interval according to updated frequency analysis of the USGS data (through 1995), whereas a discharge of that same magnitude corresponds to only a 30-year recurrence interval when interpolated from the Corps' published hydrology (Figure 17).

The Water District has specified, in Directive #1 (see Appendix A), the design discharges to be used for the present study. Within the upper part of the study, Reach A, the design discharge corresponds to the Corps' published 100-year (one percent) flood of 17,000 cfs (481.39 m^3/s). This is the same discharge used for the design of other reaches of the Guadalupe River, including the Corps' recent bypass project through downtown San Jose. According to Directive #1, additional flows are to be added incrementally downstream of Highway 101 up to a flow of 20,000 cfs (566.34 m^3/s) below Tasman Road. This is to account for storm water pump station inflows from CalTrans and the Cities of Santa Clara and San Jose. Table 5 gives the SCVWD-specified discharges that form the basis of the analysis herein.

Table 5
Lower Guadalupe River Flood Protection Project Design Flows
(specified by SCVWD)

Location	Design Discharge $(m^3/s)^{(A)}$	$(cfs)^{(B)}$
Downstream of Los Gatos Creek (for present study, below I-880 stn. 17,612)	481.39	17,000
Downstream of Highway 101 (station 14,501)	509.70	18,000
Downstream of Montague Expwy (station 11,807)	538.02	19,000
Downstream of Tasman Road (station 9,222)	566.34	20,000

(A) – units are cubic meters-per-second (B) – units are cubic feet-per-second

4.0 HEC-RAS Model Development

4.1 Cross-Section and Bridge Geometry

The HEC-RAS model used in this study is a modification of the original Water District HEC-2 backwater model dated 1997. Cross-sections in the model are generally spaced 30 meters apart throughout the study reach. The cross-sections were developed from January 1996 photogrammetric mapping data (generally every 30 meters), and merged with May 1996 channel survey data of the low flow channel. The low flow channel was apparently surveyed for every third model cross-section (i.e. surveyed every 90 meters) throughout most of the study reach, with the low flow channel for the remaining two cross-sections between each survey determined by interpolation methods.

The Water District HEC-2 model consisted of five separate input files, each covering a sub-reach of the Lower Guadalupe River. For the previous sediment engineering study recently completed by NHC for the Water District (NHC, 2000), the five input files were merged to form one continuous HEC-2 input deck, extending from San Francisco Bay upstream to Interstate 880. Modifications were also made to the bridge data in the HEC-2 input deck, and cross-sections at the UPRR (formerly SPRR) and the Gold Street bridges were updated with more recent surveys. The bridges were modified from predominantly special bridge method with one representative composite pier to a normal bridge method with individual piers specified. Refinements were also made to contraction and expansion coefficients. Furthermore, many cross-sections were "cleaned up" by altogether removing ineffective cross-section points located outside of the levees.

For the present study, this modified HEC-2 input file was imported into HEC-RAS, which is the Corps of Engineers' successor to the HEC-2 modeling software. Once in HEC-RAS, further refinements were made to the model. Each bridge was compared to as-built bridge plans, if available. Where necessary, refinements were made to the bridge decks and piers to more accurately define the bridge opening. Bridge pier widths were initially assigned to depict the same amount of debris as was assumed by the Water District in their original HEC-2 models.

4.2 Levees

Earthen flood control levees border both banks of the channel along the entire project reach. In order to compare the height of the levees to design water surface elevations, longitudinal profiles were created for both levees. This was accomplished using the "levee" option in the HEC-RAS model, an option in which the user identifies the points on each cross section that represent the top of each levee. As noted in Section 4.1, the cross sections were compiled by the Water District from 1996 topographic mapping. Therefore, the accuracy of the levee profiles is limited to the accuracy of the available mapping. The HEC-RAS levee profiles appear reasonable when compared with profiles of the levees that have been created from a variety of other data sources. However, much more detailed field surveys are required to establish accurate levee profiles for final design and construction.

During high flows, water will overtop a low section of levee on the west (left) bank a short distance downstream from the UPRR bridge near Alviso. This is the only documented location within or near the study reach of significant levee overtopping during recent flood events. This overtopping location was simulated in the HEC-RAS model by adding a junction and overflow branch at the location of the levee overtopping. The overflow portion of the levee was then inserted to the overflow branch as an inline weir spillway. Other portions of levee that may potentially overtop during design event flow conditions were not accounted for. In other words, all of the flow was confined to the channel by artificially assuming that the levees had infinite height (often referred to at the "glass-walled" scenario).

4.3 Calibration

The HEC-RAS model was calibrated to water surface profile data from the March 10, 1995 flood of record. High water mark data from the event were provided by the Water District and extend from station 6,600 near Alviso to 17,612 at Interstate 880. The Water District estimated the high water mark elevations using photogrammetry and aerial interpretation, and they correspond to peak water levels along the left bank, center, and right bank portions of each cross-section. These three elevations were averaged at each section (throughout most of the reach, there is no significant lateral variability in the data per cross-section) and input as observed data to the HEC-RAS model. The peak discharge during that event was estimated by the USGS at their Guadalupe River at San Jose gage (below Los Gatos Creek) to be 11,000 cfs (311.5 m^3/s). This was the flow rate used along the entire project reach and no adjustments were made for local inflows from storm water pump stations, because the inflows were not known and are not believed to have significantly affected the peak. To estimate the tailwater elevation during the flood downstream from the project reach, an estimate had to be made of the amount of water that overtopped the west levee downstream of the UPRR bridge. Trial and error simulations were required with the model to balance the junction (the model includes the breakout as a separate reach with the overtopping levee as a weir). The final calibration run resulted in an estimated overflow of about 3,215 cfs (91 m^3/s), with the remaining flow of 7,785 cfs (220.5 m^3/s) continuing down Alviso Slough to the Bay. It is possible that this overestimates the amount of overflow actually lost, as the overbank (weir) elevations at this location may have been higher in 1995 than at present (possibly combined with a lower tide). This does not affect calibration in the project reach upstream of UPRR. For this event (and the verification events - see next section) the approximate Mean Higher High Water (MHHW), 2.3 m NAVD 88, was assumed for tailwater conditions at the Bay, although tidal influences had no significant impact on water levels within the project reach.

Estimates of channel resistance were initially made based upon field inspections of the channel roughness, aerial photo interpretation, and references literature. At each cross-section, Manning's *n* resistance coefficients were specified separately for the low flow channel and the overbank rather than a single composite *n* value for the entire cross-section as typically prescribed by the Water District. Cross-section resistance on the overbanks was further subdivided within the Gold Street to Montague Expressway reach. Separate *n* values were specified for the minimally vegetated levee side slopes, and the remainder of overbank (between levee toe and low flow channel bank) which is dense with bulrush and other vegetation. This procedure allows a more accurate assessment of any alternatives that involve modifications on either part of the cross-section. Elsewhere in the project reach, the resistance across the entire overbank is found to be more uniform. Furthermore, an attempt was made to keep Manning's *n* values constant on a reach-by-reach basis if the vegetation did not change significantly from cross-section to cross-section.

To calibrate the HEC-RAS model it was run for the March 1995 flow conditions. Initial computed results compared fairly well to the high water data in most areas. Slight refinements were made to the Manning's *n* values in places to better refine the calibration. The final *n* resistance values are presented below in Table 6.

Table 6
Manning's *n* Resistance Coefficients for Calibrated HEC-RAS Model

Sub-Reach	Low-Flow Channel	Overbank
UPRR (stn 7005) to Gold St (stn 7115)	0.03	0.80
Gold St (7115) to Hwy 237 (8010)	0.03	0.20 (0.04 levee)*
Hwy 237 (8010) to Tasman (9240)	0.027	0.20 (0.04 levee)*
Tasman (9240) to Station 9960	0.03	0.25 (0.04 levee)*
Station 9990 to Station 10800	0.03	0.20 to 0.10 (0.04 levee)*
Station 10830 to Station 11670	0.027 to 0.03	0.06 (0.04 levee)*
Station 11700 to Montague (11825)	0.03	0.08 (0.04 levee)*
Montague (11825) to Trimble (13700)	0.05 to 0.06	0.03 to 0.06
Trimble (13700) to Hwy 101 (14525)	0.03	0.05
Hwy 101 (14525) to Parking Lot (14695)	0.02	0.03
Parking Lot (14695) to Interstate 880 (17630)	0.027	0.027

* At these locations, a value of 0.04 was assigned to the side slope face of the levees. The remaining value(s) stated represent the rest of the overbank (i.e., bench, etc.).

During the course of calibration, it was necessary to reduce at two of the bridges the amount of pier debris assumed. Debris at westbound Highway 237 was reduced from approximately 2 m to 1 m per pier, while Tasman was reduced to 0.5 m. No direct measurements of debris width were taken for the 1995 flood; Table 7 presents the debris amounts per pier assumed at each bridge. The computed water surface profile for the calibrated March 1995 condition, compared to the high water mark data, is presented in Figure 19.

Table 7
Debris Amounts per Pier Assumed at Each Bridge

Bridge	Debris Width Per Pier
UPRR	2 m
Gold	1 m
Hwy 237 (west bound)	1 m
Hwy 237 (east bound)	2 m
Tasman	0.5 m
Montague	1 m
Trimble	1 m
Hwy 101	1 m
Parking Lot	1 m
Airport Parkway	1 m
Skyport	0.5 m
Interstate 880	0.75 m

4.4 Verification

Additional field-surveyed high water mark data for the January 9, 1995 and January 26, 1997 flows were provided by the Water District. The January 1995 data consist of only 18 points along limited sections of the study reach. However, the event is suitable for verifying (or validating) the calibrated model, as it had a substantial peak flow estimated at the USGS gage to be 9,290 cfs (263.1 m^3/s) which is not much lower than the March 1995 calibration event. Using the calibrated HEC-RAS model, a water surface profile was also produced for the January 1995 flow. As shown in Figure 20, the results compare favorably to the high water marks, validating the calibration. Also shown on Figure 20 is a computed profile for a January 1997 event of 5,470 cfs (154.9 m^3/s) and the measured high water marks. These results do not compare as well as the January 1995 verification event however. As illustrated, the computed water surface throughout most of the reach is lower than the high water marks, generally by about ½ meter but by as much as 1 meter in places. This is expected however. The January 1997 peak discharge was only about one-half of the March 1995 calibration event. At these lower discharges, channel roughness is higher because the influence of the vegetation is considerably greater. Therefore, the calibrated HEC-RAS model will provide reasonable water surface elevations for large floods, but will under predict channel roughness and thus water levels for the smaller events. NHC strongly recommends high flow monitoring of flows and water surface profiles, to provide the data necessary to quantify how Manning *n* varies with flow and depth on a reach-by-reach basis.

5.0 HEC-RAS Model Application to Determine Channel Capacity

5.1 Baseline Conditions

The calibrated model reflects channel conditions during the March 1995 flood, which is essentially the same as present time except for the recently constructed Skyport Drive bridge in Reach A and some slight changes in vegetation density and sediment accumulation. The baseline conditions for the Lower Guadalupe River study, from which alternatives will be developed and compared, are defined by the Water District in Directive 3 (see Appendix A). It states that the baseline is to represent the present channel condition plus the proposed SRA (Shaded Riverine Aquatic) vegetation planned within Reach A. The SRA planting is mitigation for the proposed U.S. Army Corps of Engineers' flood control project for the downtown reach of the Guadalupe River (just upstream of Interstate 880). All SRA plantings are proposed to occur within the reach between Airport Parkway and Interstate 880. The calibrated model was modified accordingly, with the resulting baseline model thus differing from the original calibrated model only upstream of Airport Parkway. At this point in the study, debris assumptions remain the same for the baseline model as in the calibration model.

In order to more accurately evaluate potential hydraulic impacts upstream of Interstate 880 due to the SRA mitigation or other components of the project, the baseline HEC-RAS model was extended upstream to Coleman Avenue. The Interstate 880 bridge was added to the model based upon CalTrans bridge plans and information contained within the Watershed Planning Study Engineers Report (SCVWD, 1997). Cross-sections from Interstate 880 to Coleman were taken directly from the existing Corps' HEC-RAS model (developed by NHC) of the downtown San Jose flood control project, with the cross-sections converted to metric units and to the NAVD 1988 datum. Otherwise, this reach of the baseline model (Interstate 880 to Coleman) is exactly the same as the downtown model, with no further refinements.

5.2 SRA Roughness Determination

Simulation of the effects of the SRA plantings required an estimation of the change in roughness, in terms of a Manning's *n* resistance coefficient, for the proposed vegetation. The SRA consists of rows of trees planted along the banks of the low flow channel, providing shade which will help control temperature in the river. Along with trees and other riparian plantings, it is expected that there will eventually be an increase in the undergrowth (brush and shrubs) in the vicinity of the plantings as well. The SRA plan is described in the Corps' mitigation and monitoring plan by the Corps and Jones and Stokes for the downtown project, revised October 1999 (USCOE, 1999). The drawings and written descriptions in the plan formed the basis of the *n* value estimation, which includes both Phases 1 and 2 of the vegetation planting. Significant research has been carried out to estimate resistance characteristics of flow through various types of vegetation. However, the difficulty lies in that every site is unique, and furthermore, in this instance we are analyzing a future condition in which most of the plantings have not yet occurred let alone matured.

As an initial estimate of SRA *n* values, a method which is described by the USGS for selecting roughness coefficients due to vegetation on floodplains (USGS, 1989) and based upon methods developed by Petryk and Bosmajian in 1975 was used. This method adjusts a base *n* value (without vegetation) to account for the diameter and density of the trees or other vegetation, depth of flow, and drag coefficient of flow around the vegetation. Assuming 1-ft diameter trees (fairly mature), with 50% mortality of the original plantings, a flow depth corresponding to design flow conditions, and average undergrowth beneath the tree canopy, a Manning's *n* value of 0.14 was estimated. This value corresponds only to the area where the riparian plantings occurred (generally along the low flow banks). Assuming a base *n* value of 0.035, composite *n* values representing the entire overbank (but not including the low flow channel) were then determined to be 0.075 for the reaches with 4 rows of plantings, and 0.042 for the upper reach with single row plantings. Based upon further research into other literature combined with engineering judgement, an additional higher (more conservative) estimate was made for the overbank Manning's *n* values due to SRA: 0.10 along the 4 row reaches, and 0.05 along the single row reaches. Two baseline RAS models were subsequently developed, one for each assumed SRA roughness, which more or less provides a sensitivity analysis under a range of potential SRA conditions.

The calibrated baseline condition HEC-RAS model was then applied for the design flow conditions, ranging from 17,000 cfs (481.4 m^3/s) at the upstream end of the reach to 20,000 cfs (566.3 m^3/s) downstream of Tasman (see Part 2 Section 3 of this report). The final baseline design run resulted in an estimated overflow along the west bank near Alviso of 9,535 cfs (270 m^3/s), with the remaining flow of 10,465 cfs (296.3 m^3/s) continuing down Alviso Slough to the Bay. Tailwater conditions at the Bay were based upon the 10-year tide of 3.1 m NAVD 88 (USCOE, 1984), although under design flood conditions the tide had minimal effect on computed water levels upstream from Alviso. The baseline RAS design water surface profile from the Bay to Interstate 880 (under glass-walled conditions), compared to the levees, is presented in Figure 21. A close up profile from Highway 101 to Coleman is presented in Figure 22, comparing the design profiles under each of the two assumed SRA conditions to the non-SRA condition. Similarly, a close up of the design baseline profile from Alviso (UPRR bridge) to Highway 101 is also presented in Figure 23. Under the more conservative SRA assumption of $n = 0.10$ (Figure 22), the water surface at the downstream face of Interstate 880 remains under the target elevation of 17.86 m but nearly matches this target at the upstream face. Therefore, we are very close to other present criteria at Interstate 880; however, it is important to try to validate some of the vegetation roughness assumptions (field verification is recommended).

5.3 Channel Capacity

The calibrated baseline HEC-RAS model was used to estimate the present capacity of the Lower Guadalupe channel from UPRR to Interstate 880 (*i.e.* the present level of protection of the levee system). A series of six profiles were simulated with the model, ranging in 3,000 cfs increments from 8,000 cfs (226.5 m^3/s) to 23,000 cfs (651.3 m^3/s). The profile results are plotted in Figure 24, compared to the top of levee profiles. Again, it should be noted that for locations where the levee is overtopped, a glassed-wall scenario is assumed. In such places the actual water surface would still overtop the levee, but not to the level depicted in the profile plot. This approach identifies locations where there are present risks of overtopping.

The capacity of the Alviso Slough reach, downstream of the UPRR bridge, is dependant upon the coincident downstream tide at the Bay and cannot be correlated directly to a specific discharge. For the purpose of channel capacity evaluation, however, downstream boundary conditions assumed a normal depth tailwater condition. Under this condition, the model indicates that at a discharge of about 8,000 cfs (226.5 m^3/s) flow would begin to overtop low spots in the Alviso Slough levee system. Upstream of the UPRR bridge, within the project reach, the effects of assumed tide on channel capacity is minimal.

The channel capacities stated herein do not account for any freeboard, but rather they estimate the ultimate level of protection provided by the present levees prior to overtopping (as shown in Figure 24). Should freeboard be added, the actual capacities would be less. As summarized below in Table 8, from UPRR upstream to Highway 237 incipient overtopping corresponds very closely to the 17,000 cfs (481.4 m^3/s) profile. Above Highway 237 and upstream to Montague Expressway, the overall channel capacity drops to about 14,000 cfs (396.4 m^3/s), although with some sections of this reach capable of passing up to about 15,500 cfs (438.9 m^3/s). Channel capacity gradually increases from Montague upstream to Highway 101. Just above Montague the capacity is about 15,000 cfs (424.8 m^3/s), at Trimble about 20,000 cfs (566.3 m^3/s), and just below Highway 101 it is over 23,000 cfs (651.3 m^3/s). Just above Highway 101 the channel capacity drops to about 18,500 cfs (523.9 m^3/s), then increases with distance upstream to about 23,000 cfs (651.3 m^3/s) at Airport Parkway. Capacity in the remainder of Reach A upstream from there exceeds 23,000 cfs.

Table 8
Approximate Channel Capacity by Sub-Reach*
(Between Levees with No Remaining Freeboard)

Sub-Reach	Discharge (cfs)	Discharge (m^3/s)
UPRR (stn 7005) to Hwy 237 (stn 8010)	17,000	481.4
Hwy 237 (8010) to Montague (11825)	14,000	396.4
Montague (11825) to Trimble (13700)	15,000 to 20,000	424.8 to 566.3
Trimble (13700) to Hwy 101 (14525)	20,000 to 23,000	566.3 to 651.3
Hwy 101 (14525) to Airport Parkway (15685)	18,500 to 23,000	523.9 to 651.3
Airport Parkway (15685) to Interstate 880 (17630)	Over 23,000	Over 651.3

* Values represent approximate ultimate capacities within the present levee system for sub-reaches of the project, assuming no remaining freeboard.

Considering the Lower Guadalupe system as a whole, the ultimate channel capacity is approximately 14,000 cfs (396.4 m^3/s), with the most limiting reach located between Tasman and Montague. Upstream of Trimble bridge and through the remainder of the project reach, the channel appears generally capable of passing the design discharge. Over most of this area, freeboard height may be adequate, although the levees would still require FEMA certification. Therefore, it would appear that any flood control alternatives should concentrate primarily on lowering flood levels downstream of Trimble. Considering levee freeboard requirements, the present condition design profile (Figure 21) would need to be lowered by (or the levees raised by) up to 2 m or more in parts of this reach.

5.4 Bridge Capacity

The calibrated baseline HEC-RAS model was also used to estimate the capacity of the existing bridges in the project reach. Model cross-sections of each bridge were compared to computed water levels from the range of events simulated for the channel capacity analysis (see previous section), in order to determine the discharge rate at which the flow changes from free-surface to pressure at each bridge (*i.e.* the discharge that corresponds to a water level just hitting the soffit or low chord of the bridge deck). As mentioned previously the water surface profiles are shown on Figure 24, while Table 9 below summarizes the results of the bridge capacity analysis. The stated capacities could change if debris conditions differ from those assumed (see Table 7).

Table 9
Approximate Existing Bridge Capacities

Bridge	Discharge* (cfs)	Discharge* (m^3/s)	Bridge Deck Overtop During Design Event?	Pressure Flow During the Design Event?
UPRR	19,000–22,000	538.0 – 623.0	No	No
Gold	16,000–18,000	453.1 – 509.7	No	Yes
Hwy 237 (west bound)	18,500–20,000	523.9 – 566.3	No	Yes (barely, at upstream face)
Hwy 237 (east bound)	8,500–9,500	240.7 – 269.0	Yes	Yes
Tasman	13,500–15,500	382.3 – 438.9	No	Yes
Montague	11,500	325.6	Yes	Yes
Trimble	18,000	509.7	No	Yes
Hwy 101	16,500–17,500	467.2 – 495.5	No	Yes
Parking Lot	21,000–23,000	594.7 – 651.3	No	No
Airport Parkway	20,000–22,500	566.3 – 637.1	No	No
Skyport	23,000 – over 23,000	651.3 – over 651.3	No	No
I-880 (soffit estimated)	Over 23,000	Over 651.3	No	No

* First value given per bridge represents discharge at which water surface begins to hit the bridge soffit (low chord). Second value given represents discharge at which soffit becomes completely inundated/wet (full pressure flow). Single discharge values given for bridges with horizontal (or nearly horizontal) soffits. Analysis assumes all flow confined between existing levees (glass-walled scenario described in Section 4.2).

As indicated in the table, the upstream (east bound) Highway 237 bridge is a significant constriction, capable of passing only about half the design event discharge without going to pressure flow. The Montague Expressway bridge also has a limited capacity. These two bridges are also the only ones that are shown to overtop during the simulated design flood event. Table 9 also indicates which bridges exhibit pressure flow conditions during the design event. Except for UPRR at the lower end, all bridges from Highway 101 downstream exhibit pressure flow while the remaining upstream bridges within Reach A remain free-surface. This can also be seen in the design flow profile plots of Figures 22 and 23.

Analysis of flood control alternatives needs to consider bridges in addition to levee capacities. The present free-surface flow capacity of at least two bridges is less than the limiting channel/levee capacity of 14,000 cfs. To remove these bridges from pressure flow will require lowering the design water surface (or, alternatively, raising the bridges) by more than 2 m.

6.0 Summary Part 2

In summary, the following points are important in the development of the HEC-RAS model and channel capacity evaluation:

- The model is in metric units, with all elevations referenced to the NAVD 1988 datum.
- The model extends from San Francisco Bay to Interstate 880 (the model actually extends upstream from Interstate 880 to Coleman Street. This was done by adding on a portion of an existing HEC-RAS model to the project reach model. However, no attempt was made to calibrate or refine the model upstream from Interstate 880).
- Cross-section data are based upon 1996 topographic mapping and field surveys conducted by the Water District. The sections are spaced approximately 30 m apart. The over bank portion of each cross section was estimated from the topographic maps. The low flow channel was field surveyed at 90 m intervals and merged with the appropriate cross sections. The low flow channel was interpolated at cross sections without field surveys.
- The cross-sections are oriented viewing in a downstream direction, rather than upstream as the Water District will often do. As such, all references herein to left and right banks or levees are, therefore, with respect to facing downstream. This is consistent with the Guadalupe HEC-RAS model developed for the downtown San Jose design study, and is also the "industry standard".
- Except for the Interstate 880 to Coleman reach, all of the bridges are simulated using standard HEC-RAS bridge methodologies.
- Longitudinal profiles of the levees have been estimated and appear reasonable, however, a thorough field survey is needed to establish precise heights prior to final design.
- Manning's *n* values and expansion/contraction coefficients were refined through calibration. Dependability of the calibrated model was verified with another high flow event.
- The calibrated model should only be used for large floods. Manning's *n* values will need to be increased if it is to be used for smaller events. Additional data are suggested to be able to determine how vegetation affects model roughness for flows less than about 8,500 cfs (240.7 m^3/s).

- The Baseline model is identical to the calibrated model expect it includes the Skyport Drive bridge and the proposed SRA planting plan which is mitigation for the U.S. Army Corps of Engineers Guadalupe River downtown flood protection project.

- The design flow water surface profile exceeds the height of the existing levees between the UPRR bridge and Trimble Road (under glass-walled conditions) by about ½ to over 1 m. Upstream from Trimble the profile is lower than the levees; however, the present levees may not provide sufficient capacity to comply with standard FEMA freeboard certification requirements.

- Within the project reach, water will begin to overtop the levees at approximately 14,000 cfs (396.4 m^3/s) between Tasman Road and Montague Expressway.

- Beginning just below Airport Parkway upstream through Interstate 880, the existing levees and bridges can contain a flow significantly larger than the design flow, up to approximately 22,500 cfs (637.1 m^3/s) or greater. This provides potential capacity for vegetation mitigation (SRA, CalTrans, etc.), provided target water levels at Interstate 880 for the downtown project are not compromised.

- During the design flow event, all bridges from Gold Street inclusive through Highway 101, exhibit pressure flow conditions. The upstream (east bound) Highway 237 and Montague Expressway bridges are the most constricted in the project reach; both overtop in the design event.

7.0 Recommendations

Successful development of an accurate flood protection plan will require the additional collection and monitoring of certain critical data. The following items are recommended:

- It is highly recommended that water surface profile (high water marks) and flow data be collected within the project reach during this year's runoff season, if possible, preferably over a range of flow rates: high (over 8,500 cfs if occurs), intermediate (4,000 cfs to 8,000 cfs), and low (2,000 cfs or below). This will provide the data necessary to quantify how Manning's *n* varies with depth, resulting in updated calibration of the model for the full range of expected flows – and based on the present channel condition.

- Prior to final design and construction, detailed surveys will be required to establish accurate levee profiles. It is also recommended that the bridges be re-surveyed.

- In order to develop more confidence in assumed roughness for the SRA vegetation, field monitoring during floods should be undertaken to estimate Manning's *n* values for locations along the river where similar vegetation already exists.

- Consideration should be given to monitoring pumped inflow rates during the winter, to get a feel for the significance of these additional flows during a wide range of flow events on the river.

- Cross-section surveys at select key locations should be taken periodically, to monitor trends in sedimentation (*i.e.* erosion and deposition) and cross-section geometry (*i.e.* bench development, low-flow channel).

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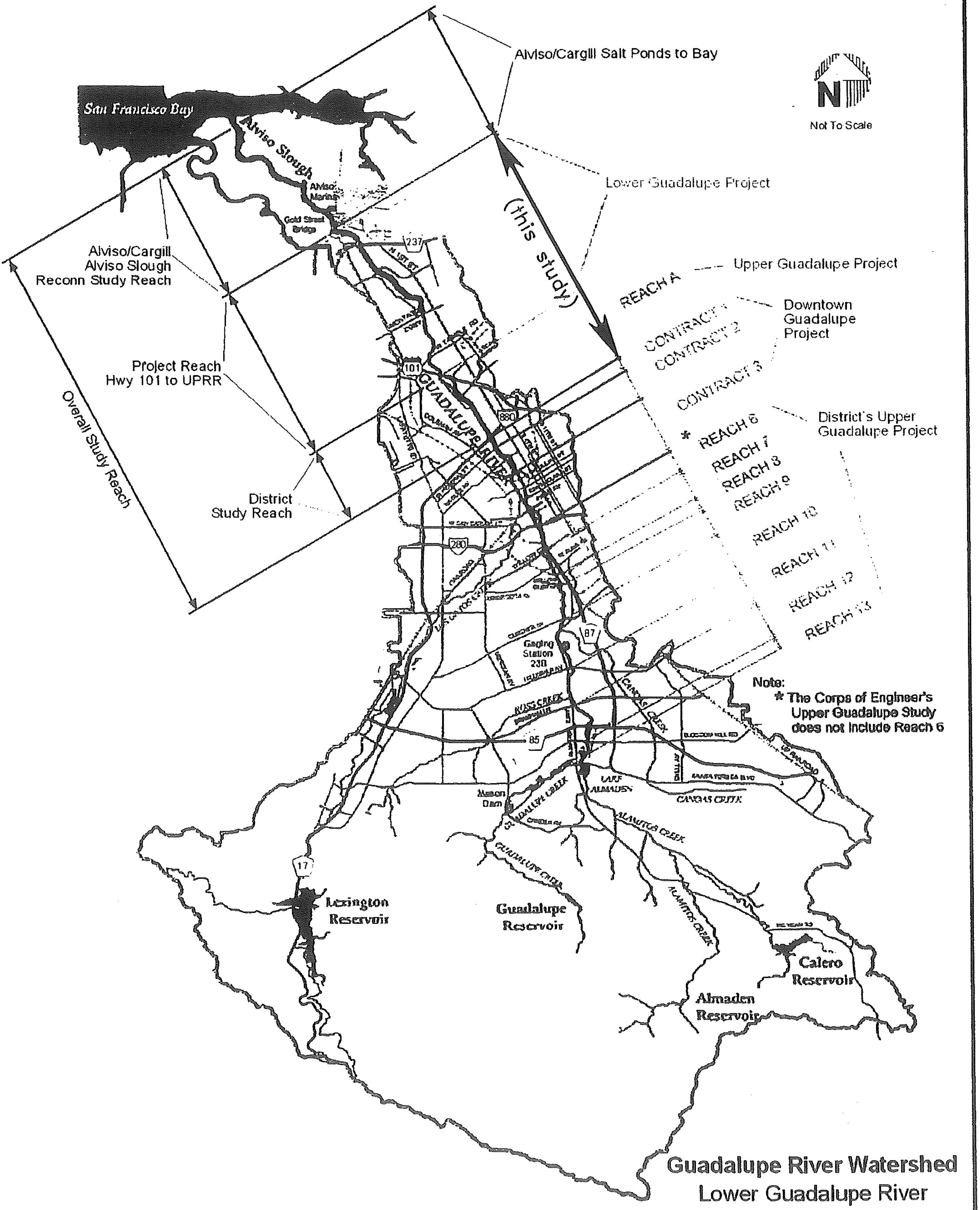
FIGURES



Note:
* The Corps of Engineer's Upper Guadalupe Study does not include Reach 6

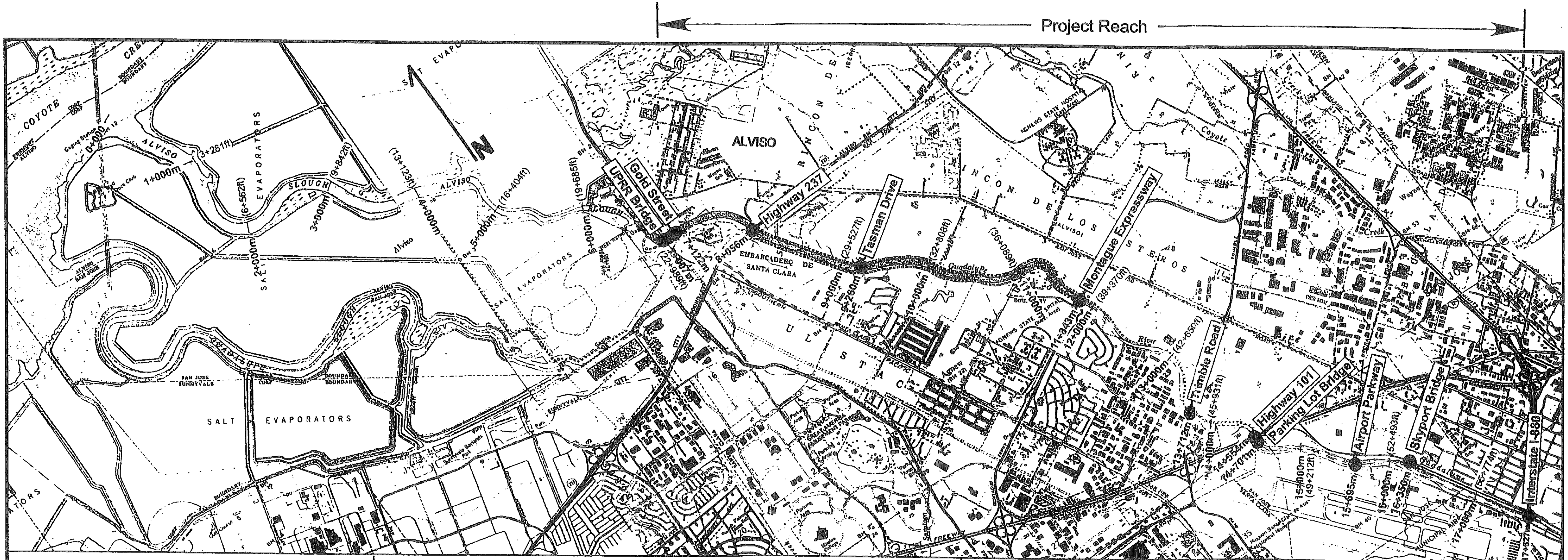
Guadalupe River Watershed
Lower Guadalupe River
Flood Control Project

nhc

Base map provided by Santa Clara Valley Water District/Completed drawing by CH2M Hill

148460.B1.ZZ SOQ\Watershed.fh8 1/21/99(DVR)

Figure 1



northwest hydraulic consultants

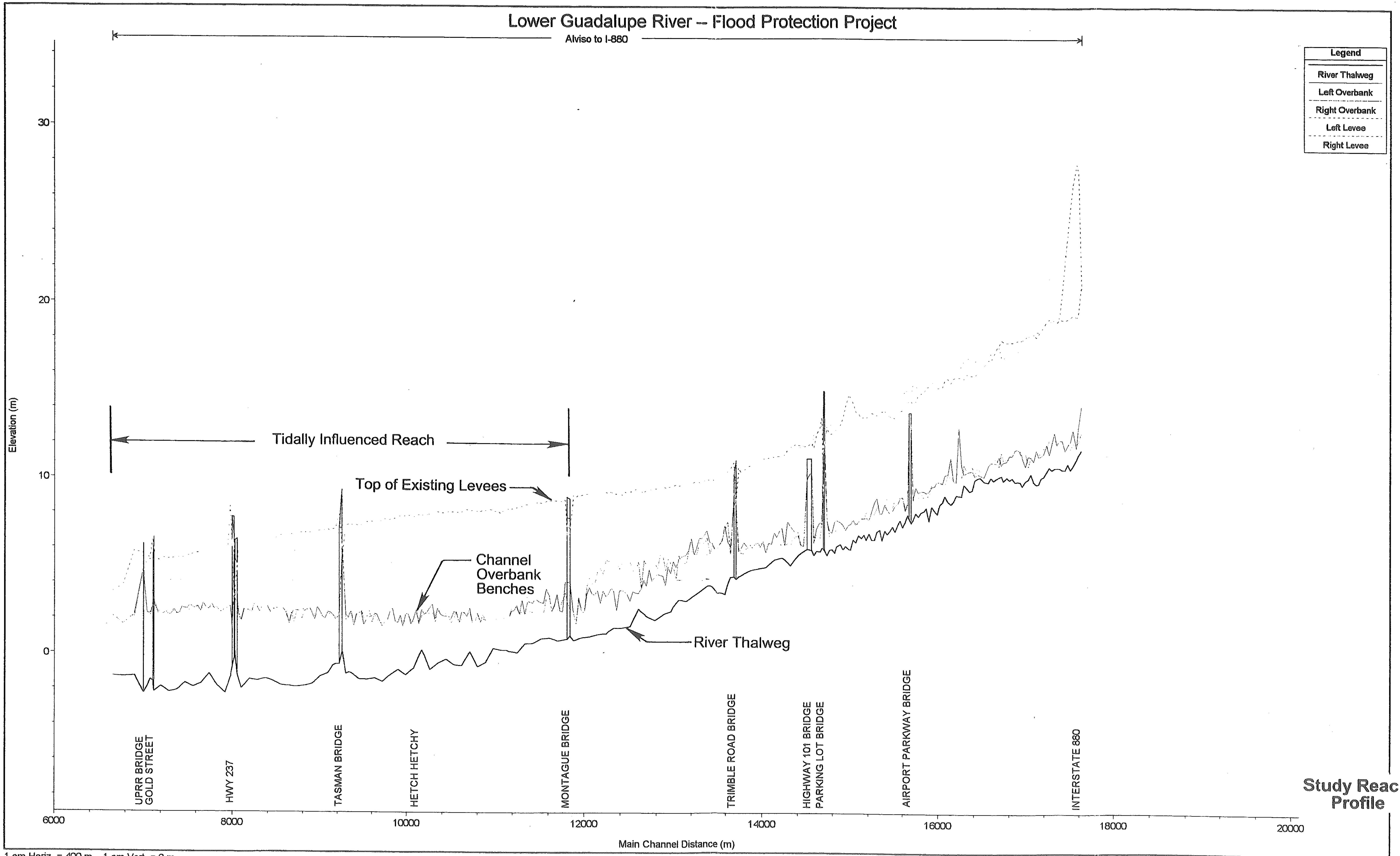
notes:
- base mapping from USGS quadrangle sheets San Jose West, CA; Milpitas, CA; and Mountain View, CA.
- All stationing is in meters, with stationing in feet shown in parentheses using the conversion 1 m = 3.2808
- Stationing indicating bridge locations is approximate.

0 1 2
kilometers

Study area map of Lower Guadalupe River

nhc

Figure 2

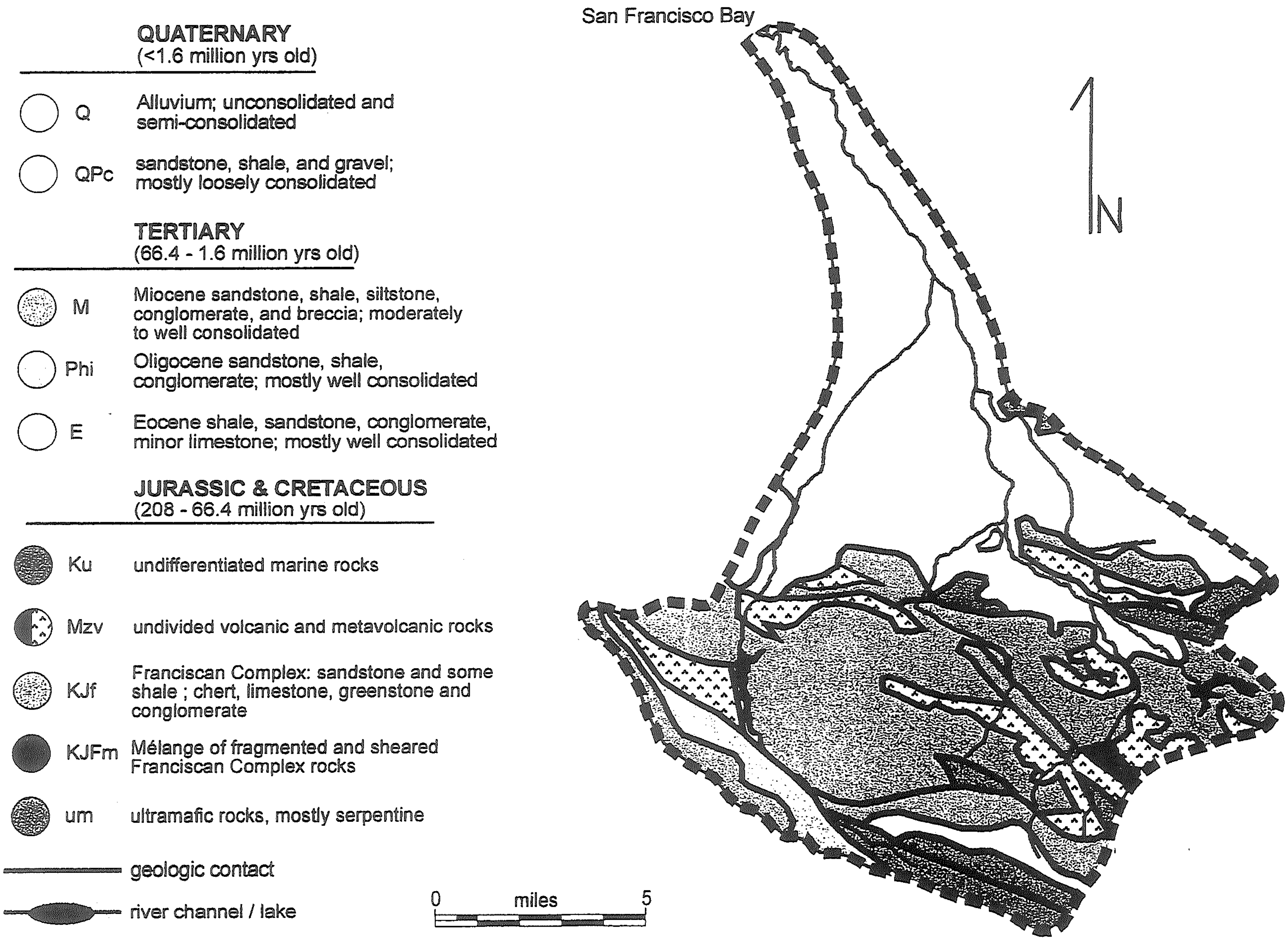


1 cm Horiz. = 400 m 1 cm Vert. = 2 m

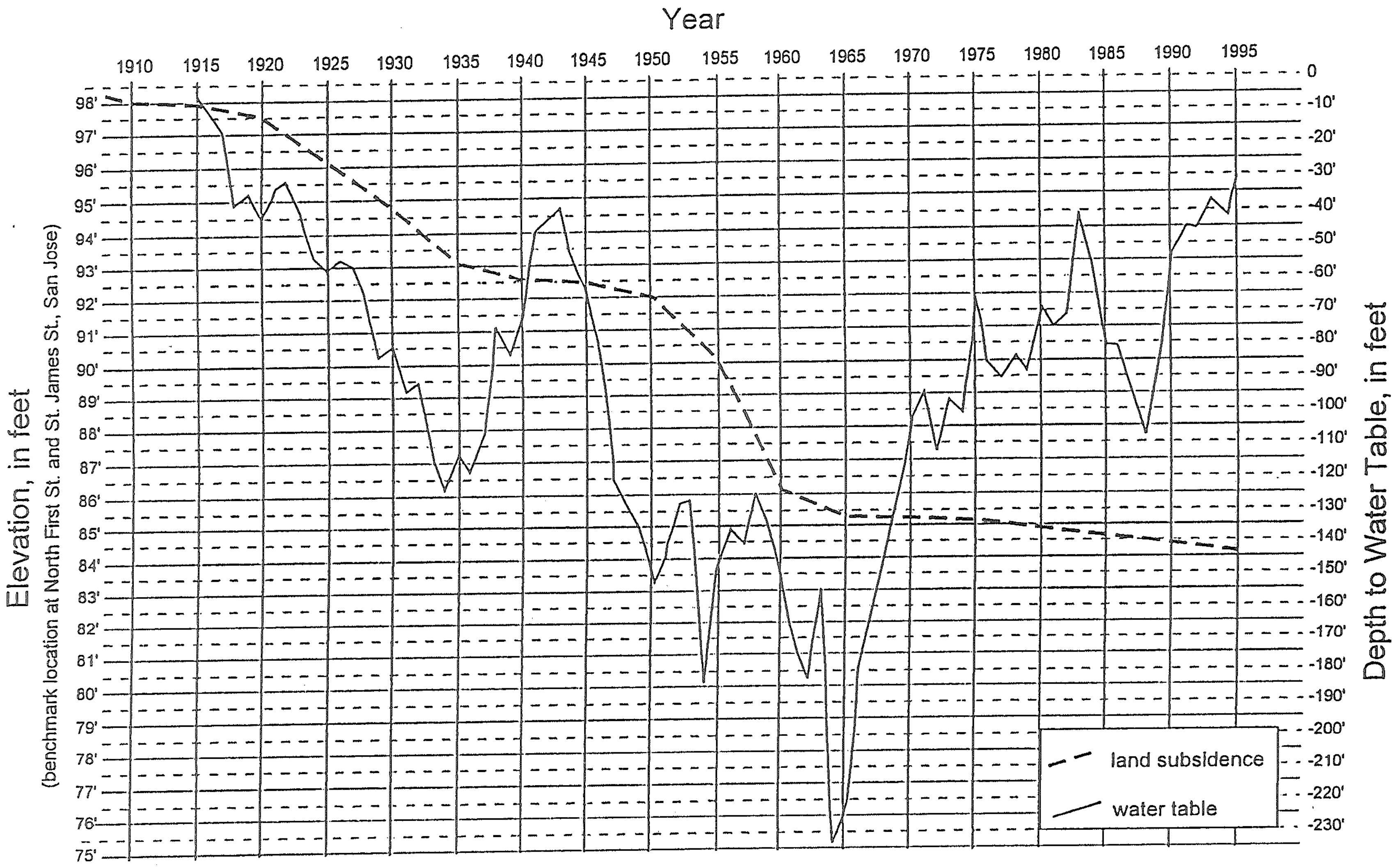
Study Reach Profile

Figure 3

Figure 4

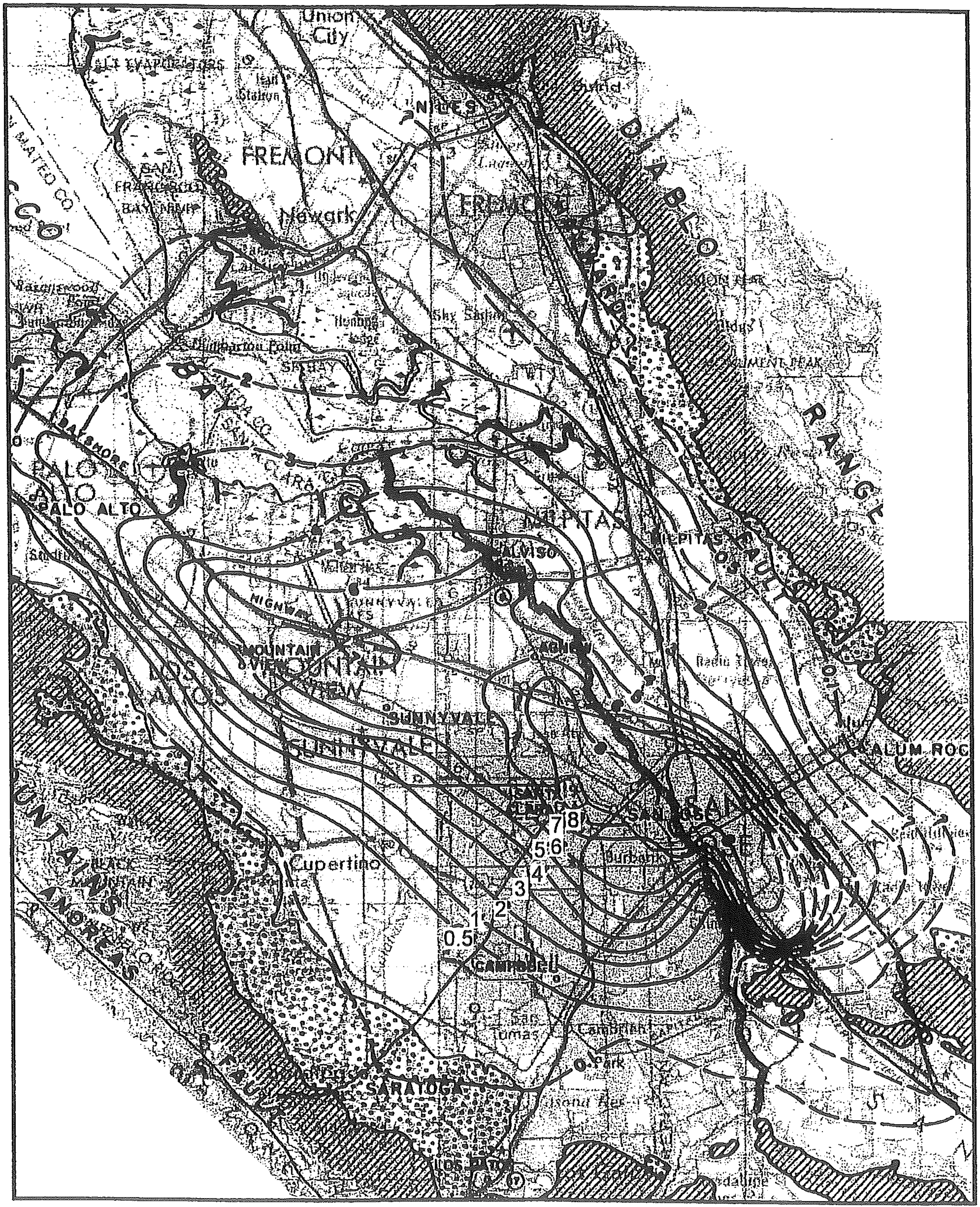

QUATERNARY
(<1.6 million yrs old)
Q Alluvium; unconsolidated and semi-consolidated
QPc sandstone, shale, and gravel; mostly loosely consolidated
TERTIARY
(66.4 - 1.6 million yrs old)
M Miocene sandstone, shale, siltstone, conglomerate, and breccia; moderately to well consolidated
Phi Oligocene sandstone, shale, conglomerate; mostly well consolidated
E Eocene shale, sandstone, conglomerate, minor limestone; mostly well consolidated
JURASSIC & CRETACEOUS
(208 - 66.4 million yrs old)
Ku undifferentiated marine rocks
Mzv undivided volcanic and metavolcanic rocks
KJf Franciscan Complex: sandstone and some shale ; chert, limestone, greenstone and conglomerate
KJFm Mélange of fragmented and sheared Franciscan Complex rocks
um ultramafic rocks, mostly serpentine
geologic contact
river channel / lake
0 miles 5
San Francisco Bay
N

Geologic map of Guadalupe River basin (from DMG, 1990). Faults are not shown.



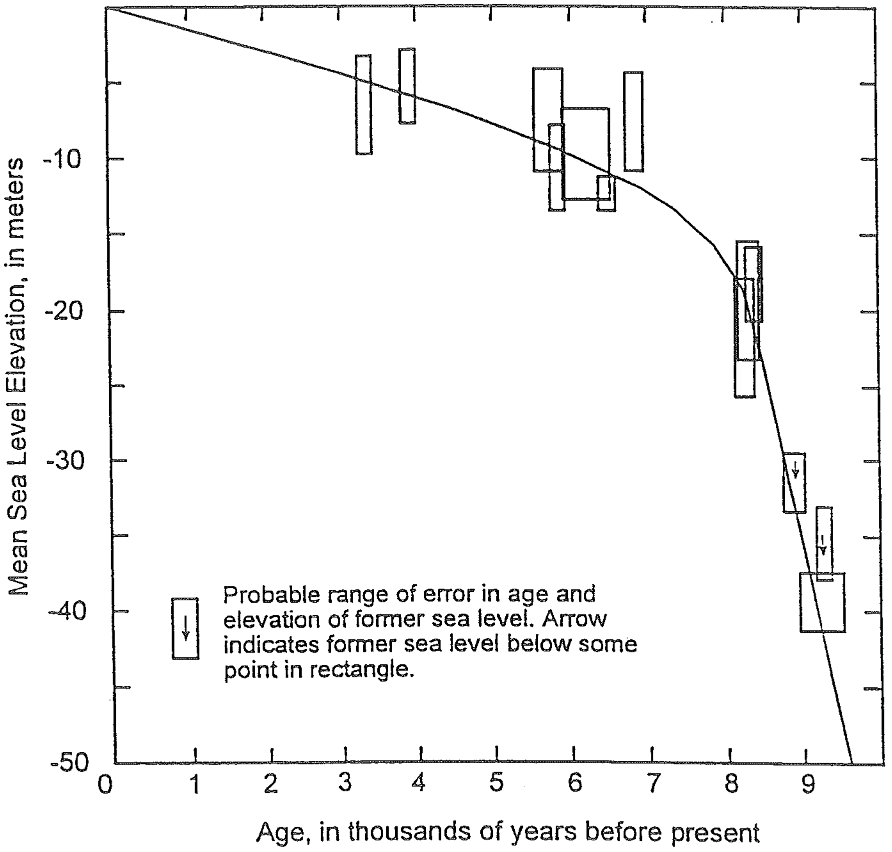
Land Subsidence and Depth to Water Table, San Jose, California (1906 - 1995) (from: SCVWD, 1997).

Figure 5



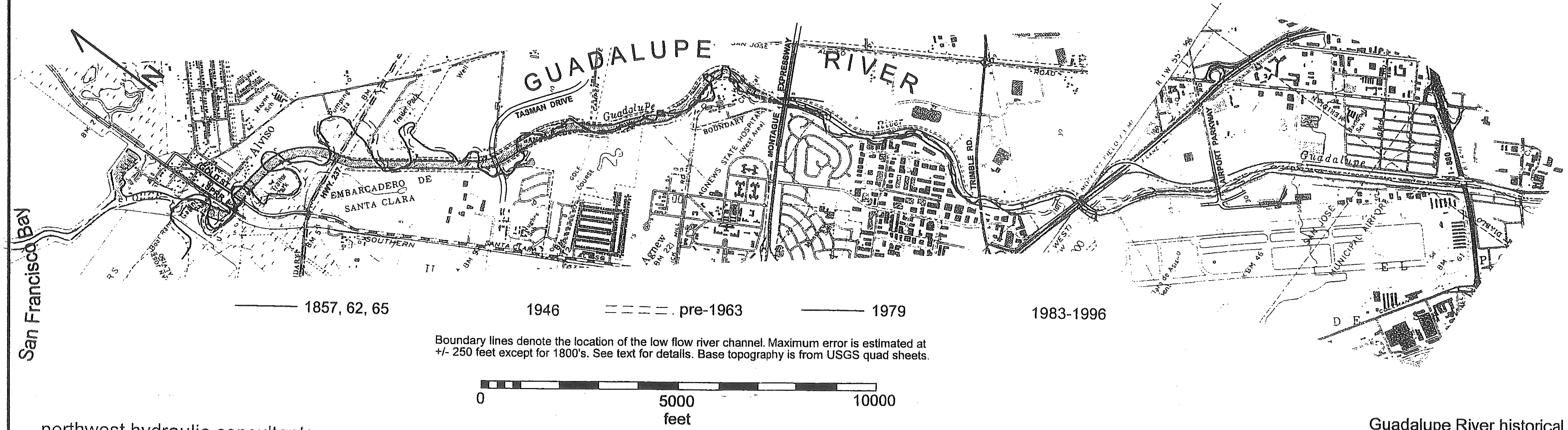
Map showing equal lines of land subsidence (in feet) in Santa Clara Valley from 1934 to 1967 (from Poland and Ireland, 1968) overlaid onto topographic mapping from the USGS. Guadalupe River is highlighted in blue.

Figure 6



Holocene sea level changes in South San Francisco Bay (from Atwater et al., 1977). Sea level has risen approximately 50 meters through the Holocene (last 10,000 years), lessening to a rate between 0.1 and 0.2 cm/year during the last 6,000 years.

Figure 7



Boundary lines denote the location of the low flow river channel. Maximum error is estimated at +/- 250 feet except for 1800's. See text for details. Base topography is from USGS quad sheets.

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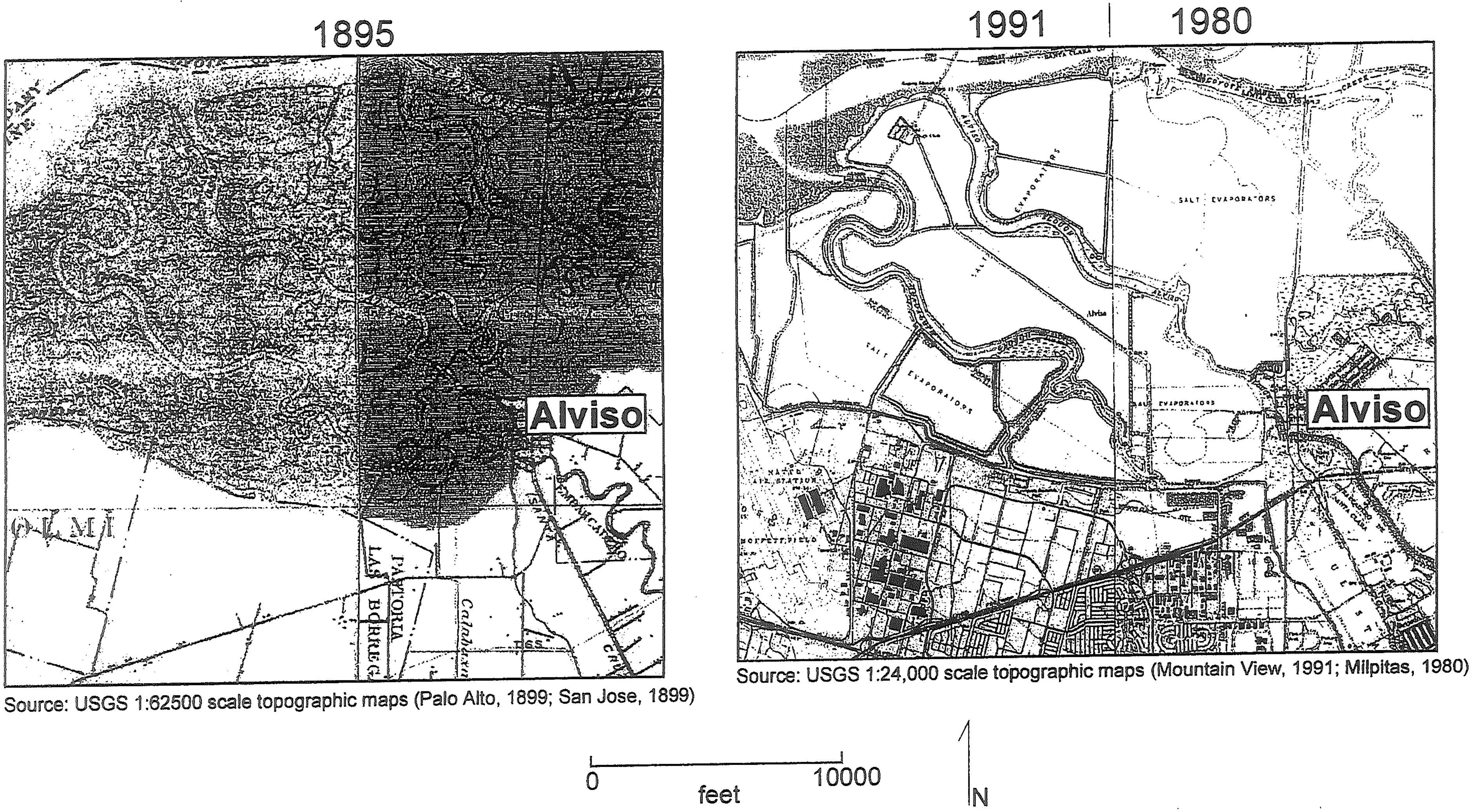
Guadalupe River historical planform shift map.

Figure 8

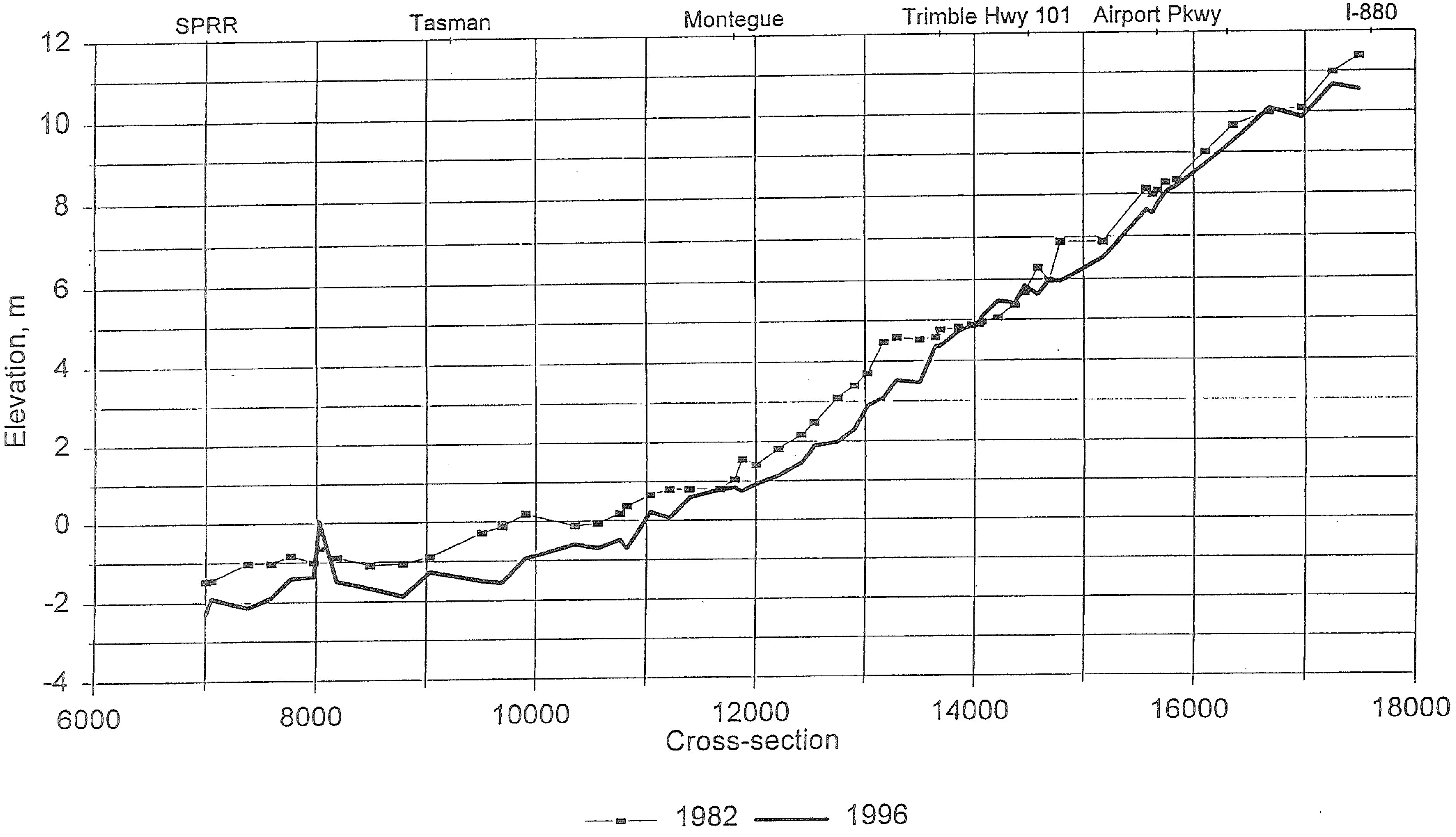


Source: USGS 1:62500 scale topographic maps (Palo Alto, 1899; San Jose, 1899)

Source: USGS 1:24,000 scale topographic maps (Mountain View, 1991; Milpitas, 1980)

Figure 9

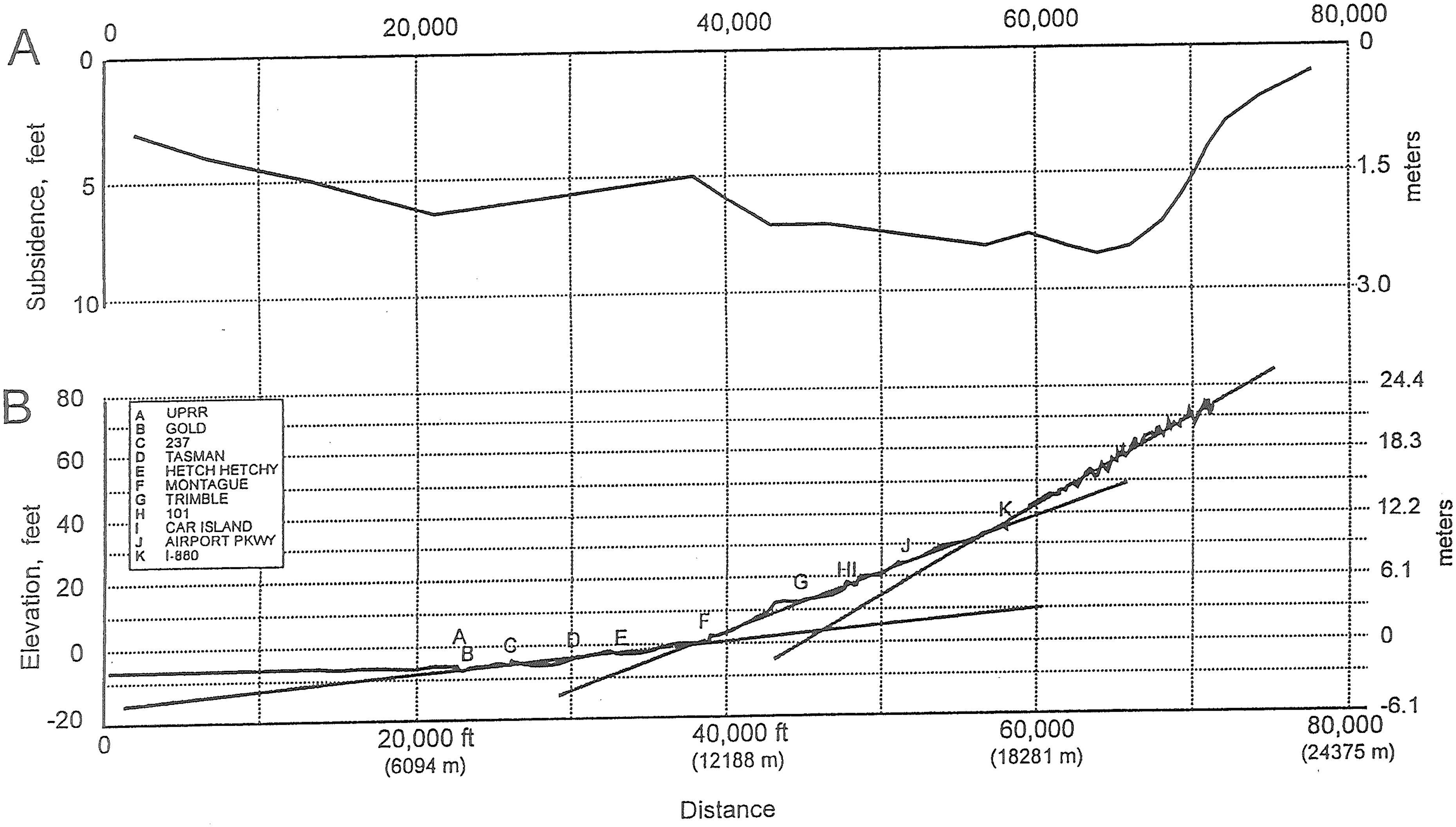
Changes in Guadalupe River planform in the tidal marsh donwstream of Alviso from 1895 to 1980, 91. The original condition exhibits many distributary flow channels whereas presently all flows are carried through Alviso slough.



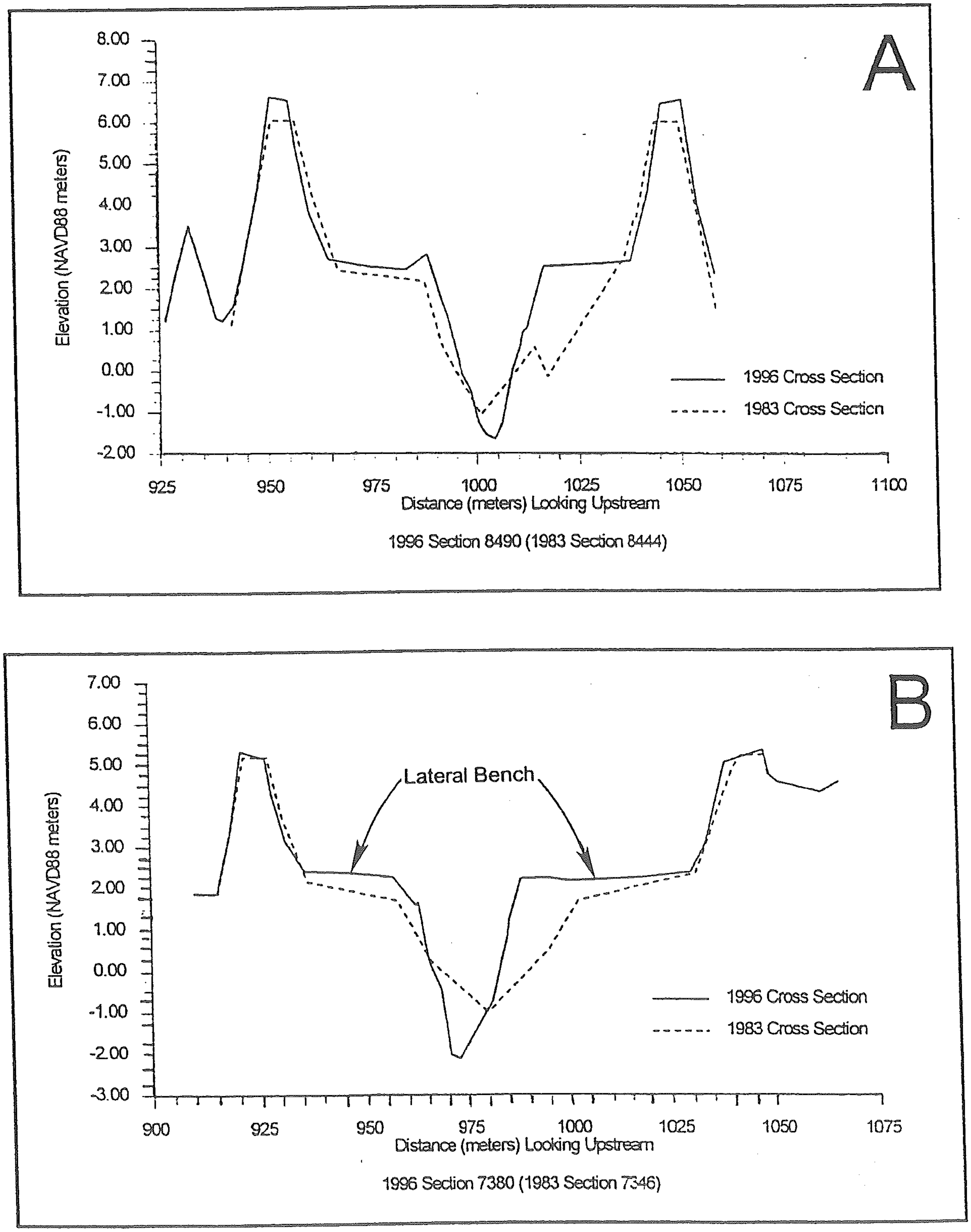
Guadalupe River invert profiles,UPRR to I-880 (from COE, 1989). All elevations set to NAD88.

Figure 10

Figure 11

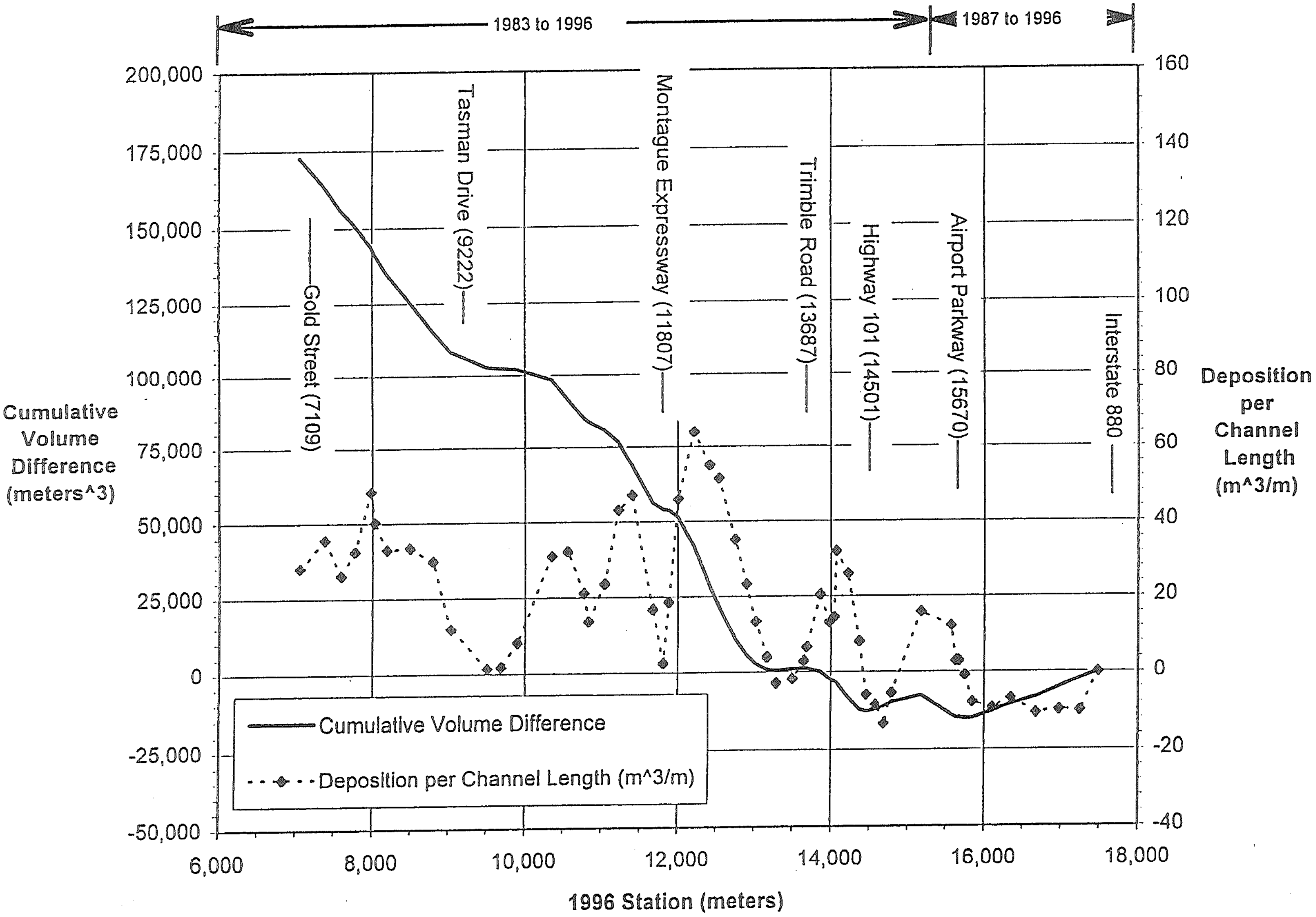


(A) Land subsidence along Guadalupe River from 1934 - 1967 (from Poland and Ireland, 1968) and (B) Guadalupe River profile (from COE, 1989). Lines identify regions of continuous channel slope. All data are set to NGVD 29.



Cross-sections from 1983 and 1996 show changes in channel geometry at (A) located 460 m upstream of Hwy 237 and (B) located 270 m upstream of Gold Street bridge. The low flow channel exhibits varying degrees of incision and narrowing resulting from sediment accumulation between the leveed banks.

Figure 12



Cumulative Volume Difference between 1983/1987 and 1996 Cross Sections

Figure 13

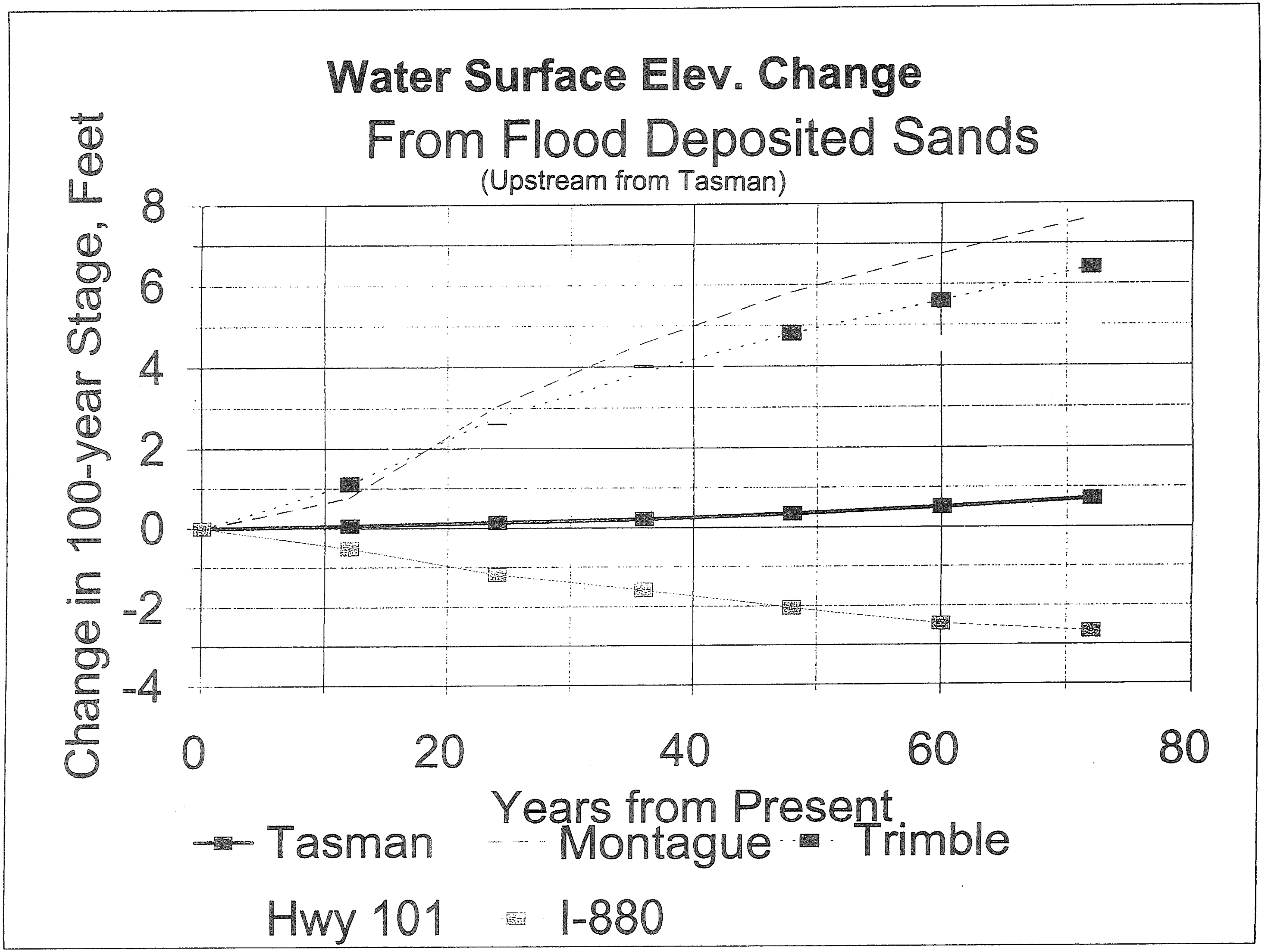

Water Surface Elev. Change
From Flood Deposited Sands
(Upstream from Tasman)
Change in 100-year Stage, Feet
8
6
4
2
0
-2
-4
0
20
40
60
80
Years from Present
Tasman
Montague
Trimble
Hwy 101
I-880

Figure 14

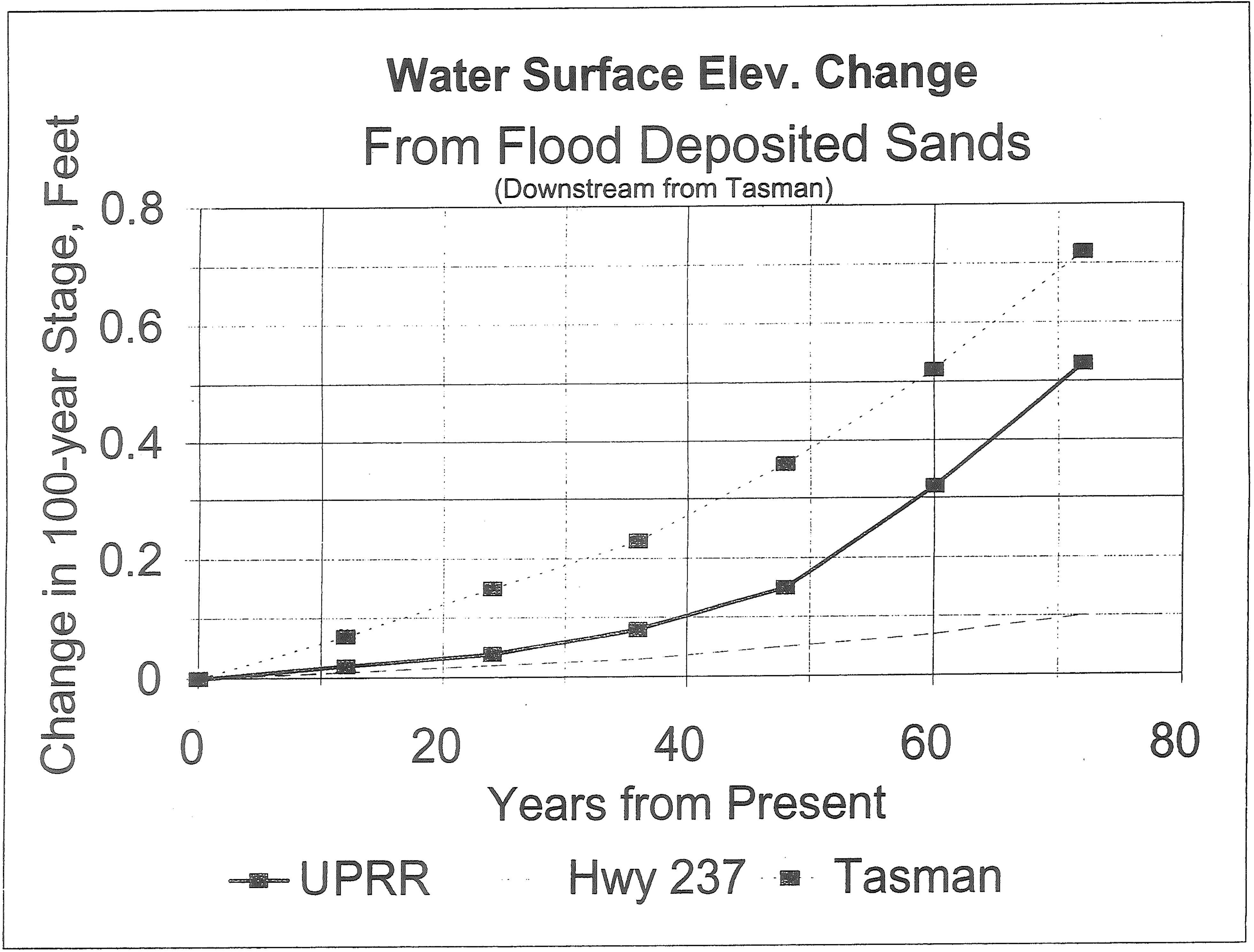

Water Surface Elev. Change
From Flood Deposited Sands
(Downstream from Tasman)
Change in 100-year Stage, Feet
0.8
0.6
0.4
0.2
0
0
20
40
60
80
Years from Present
UPRR
Hwy 237
Tasman

Figure 15

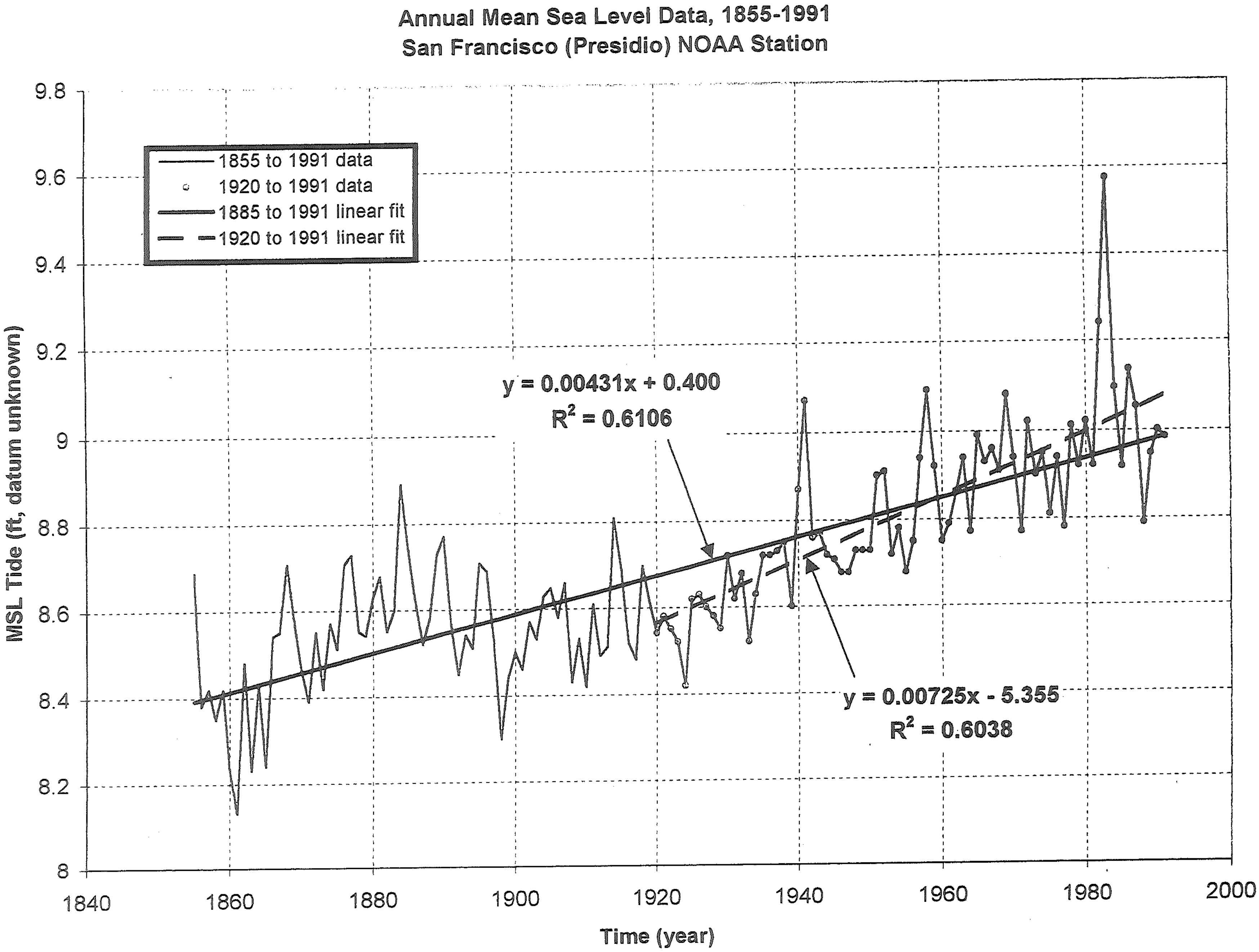

Annual Mean Sea Level Data, 1855-1991
San Francisco (Presidio) NOAA Station
1855 to 1991 data
1920 to 1991 data
1885 to 1991 linear fit
1920 to 1991 linear fit
y = 0.00431x + 0.400
R^2 = 0.6106
y = 0.00725x - 5.355
R^2 = 0.6038
MSL Tide (ft, datum unknown)
9.8
9.6
9.4
9.2
9
8.8
8.6
8.4
8.2
8
1840
1860
1880
1900
1920
1940
1960
1980
2000
Time (year)

Figure 16

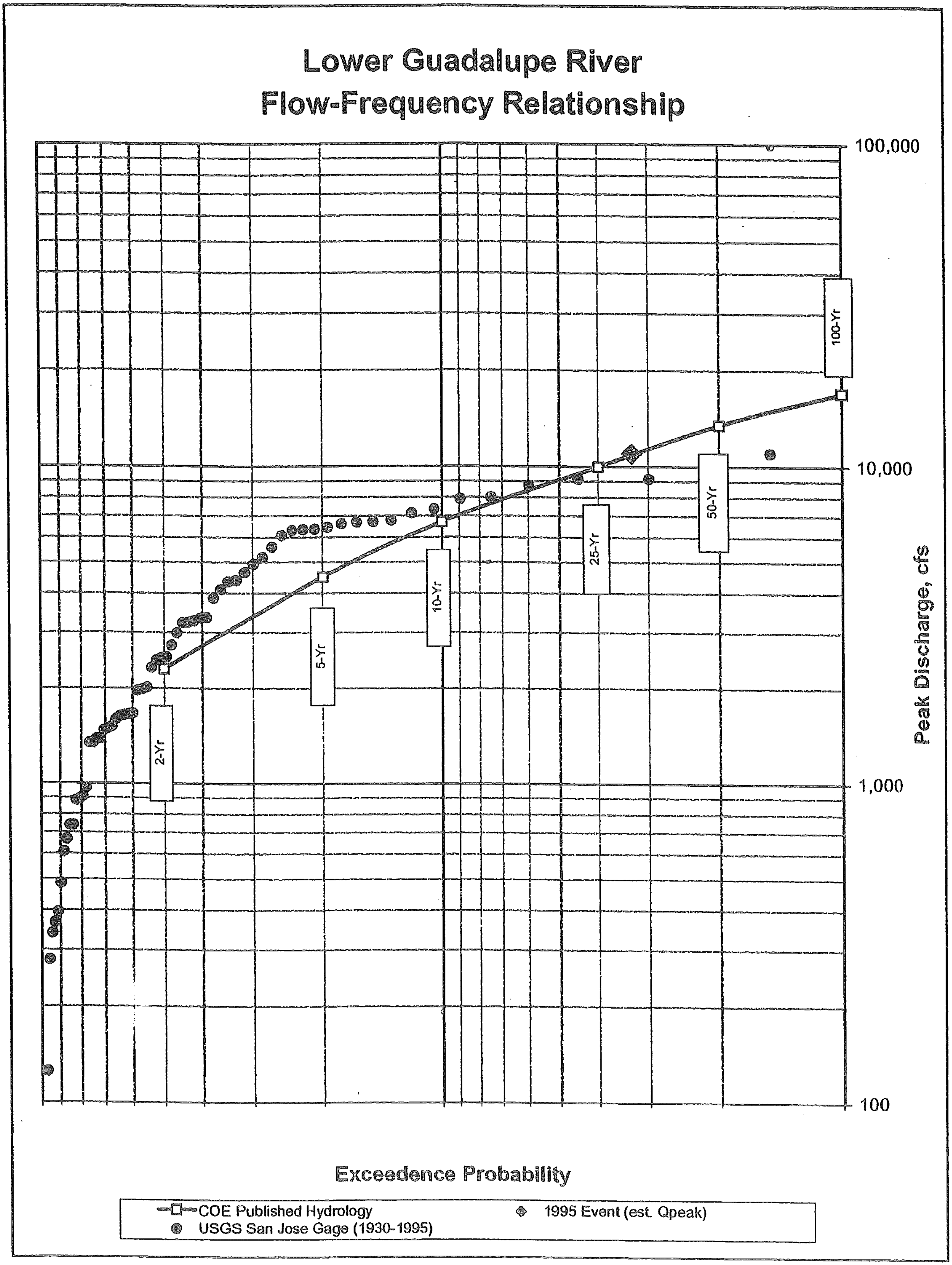

Lower Guadalupe River
Flow-Frequency Relationship
100,000
10,000
1,000
100
Peak Discharge, cfs
Exceedence Probability
2-Yr
5-Yr
10-Yr
25-Yr
50-Yr
100-Yr
COE Published Hydrology
USGS San Jose Gage (1930-1995)
1995 Event (est. Qpeak)

Figure 17

C:\Projects\50080\GUADPKS.WB2

Guadalupe River Annual Instantaneous Peak Discharges 1930 to 1997

USGS 11169000, at San Jose

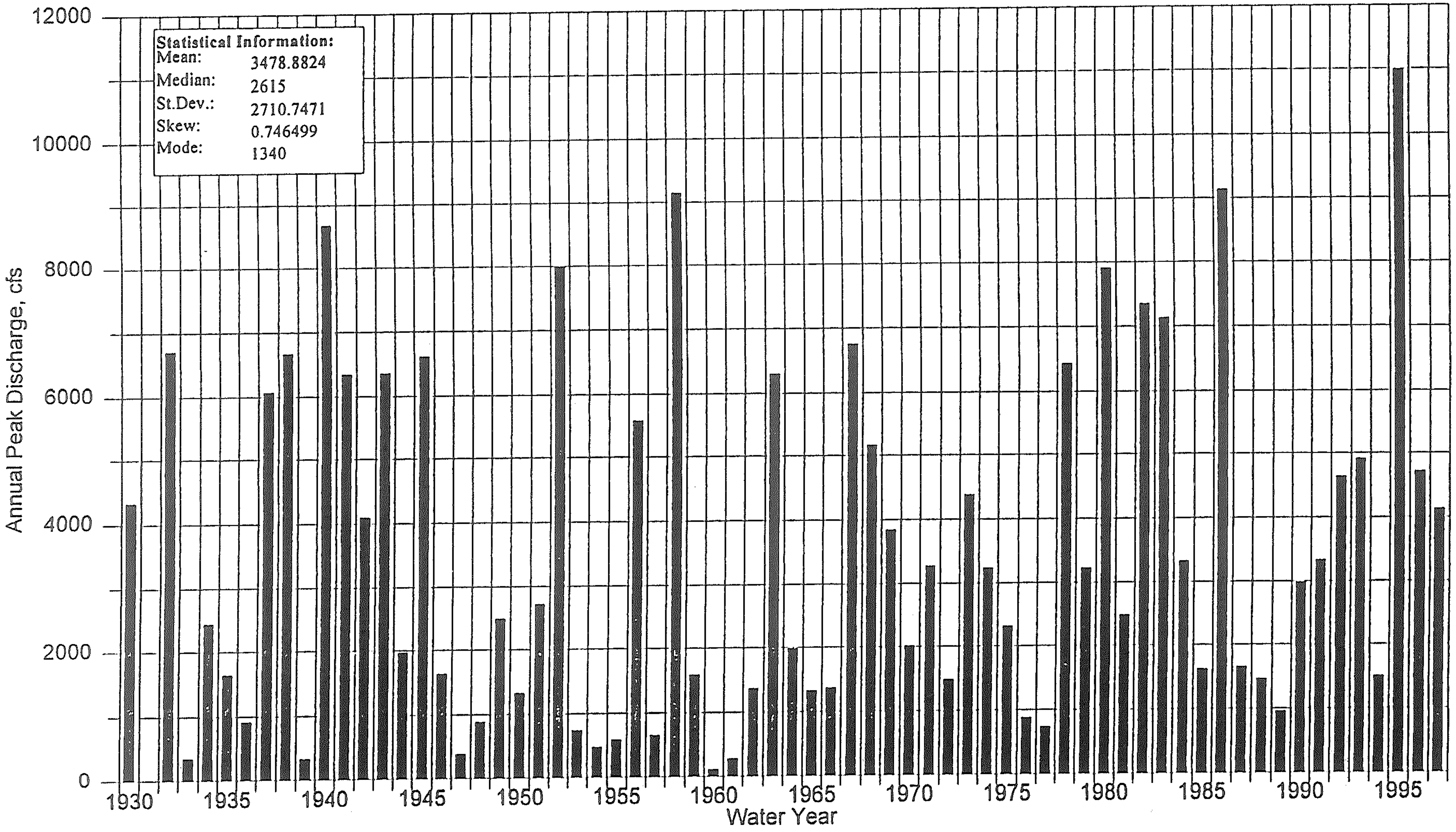
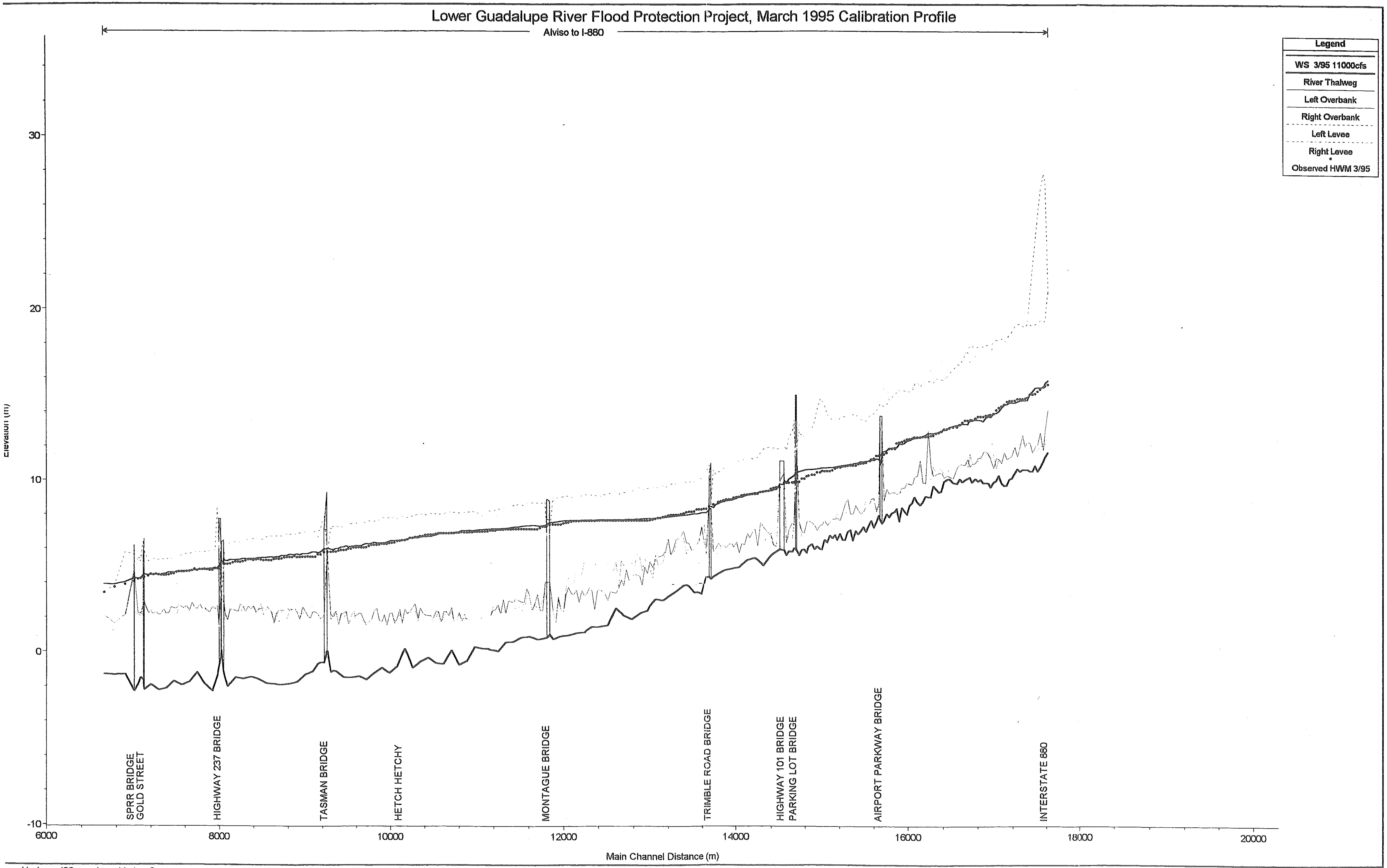


Figure 18


Lower Guadalupe River Flood Protection Project, March 1995 Calibration Profile

cm Horiz. = 400 m 1 cm Vert. = 2 m

Figure 19

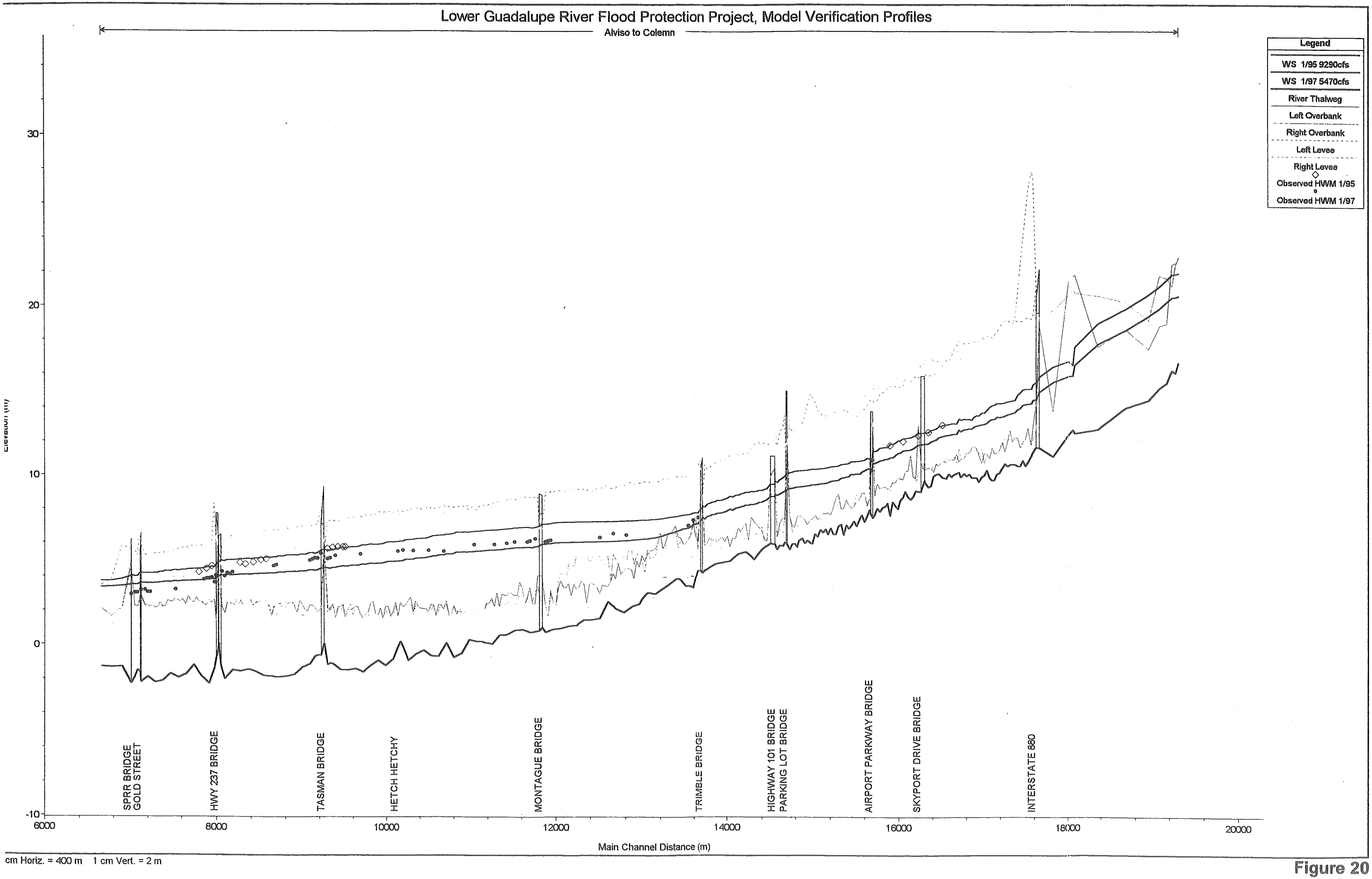
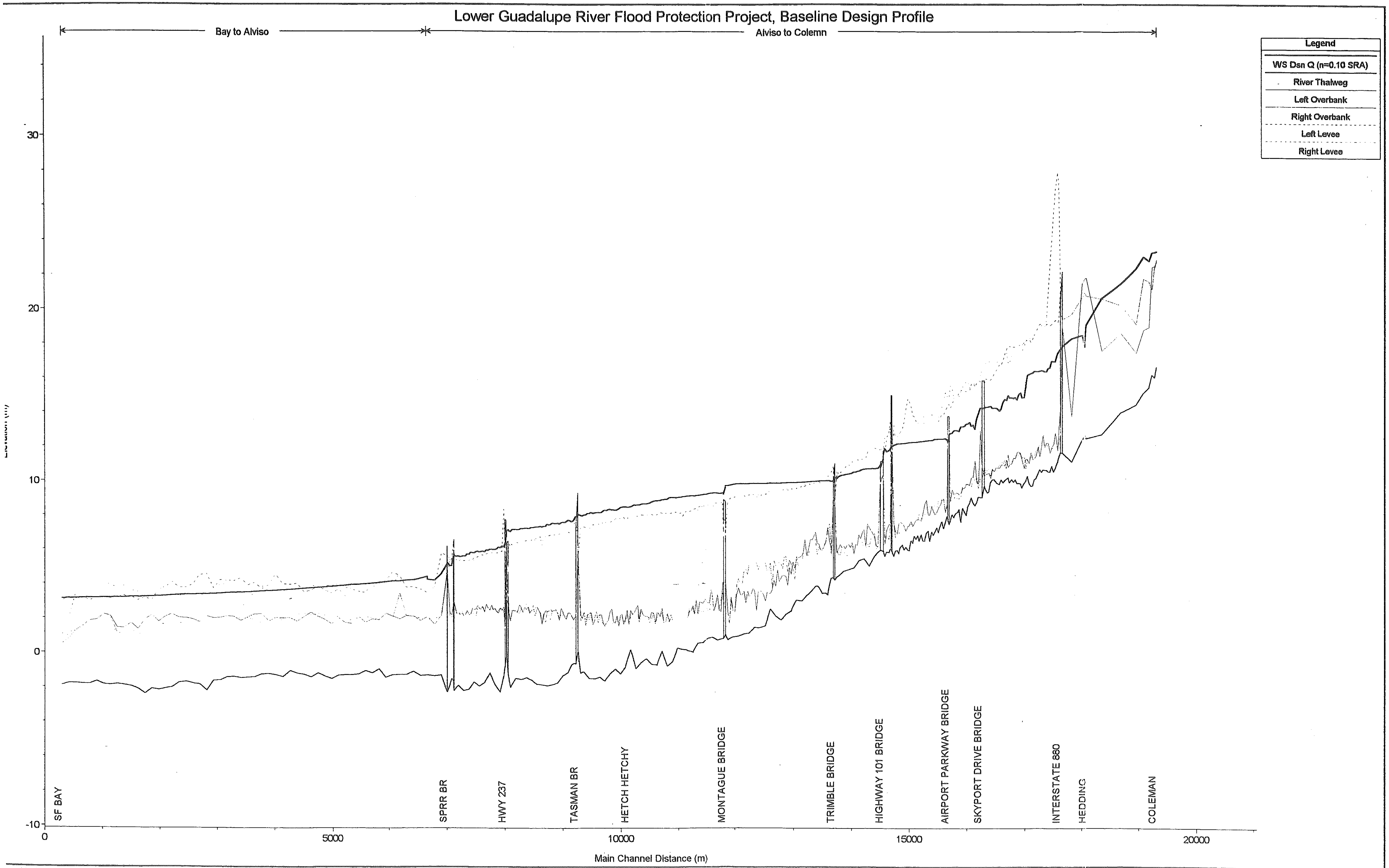
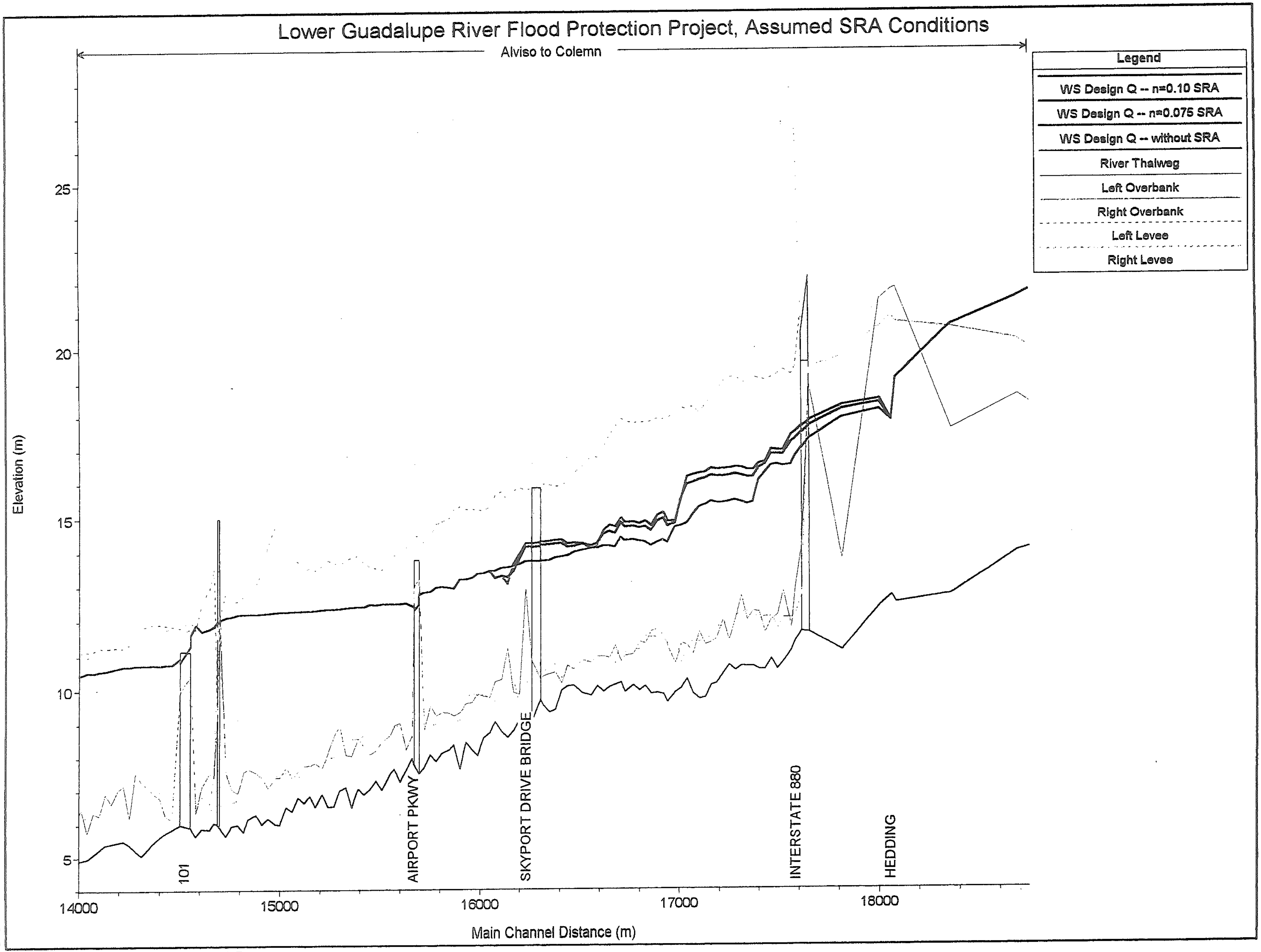

Lower Guadalupe River Flood Protection Project, Model Verification Profiles
Alviso to Colemn
Legend
WS 1/95 9290cfs
WS 1/97 5470cfs
River Thalweg
Left Overbank
Right Overbank
Left Levee
Right Levee
◇ Observed HWM 1/95
● Observed HWM 1/97
Elevation (m)
30
20
10
0
-10
SPRR BRIDGE
GOLD STREET
HWY 237 BRIDGE
TASMAN BRIDGE
HETCH HETCHY
MONTAGUE BRIDGE
TRIMBLE BRIDGE
HIGHWAY 101 BRIDGE
PARKING LOT BRIDGE
AIRPORT PARKWAY BRIDGE
SKYPORT DRIVE BRIDGE
INTERSTATE 880
6000
8000
10000
12000
14000
16000
18000
20000
Main Channel Distance (m)
cm Horiz. = 400 m 1 cm Vert. = 2 m

Figure 20



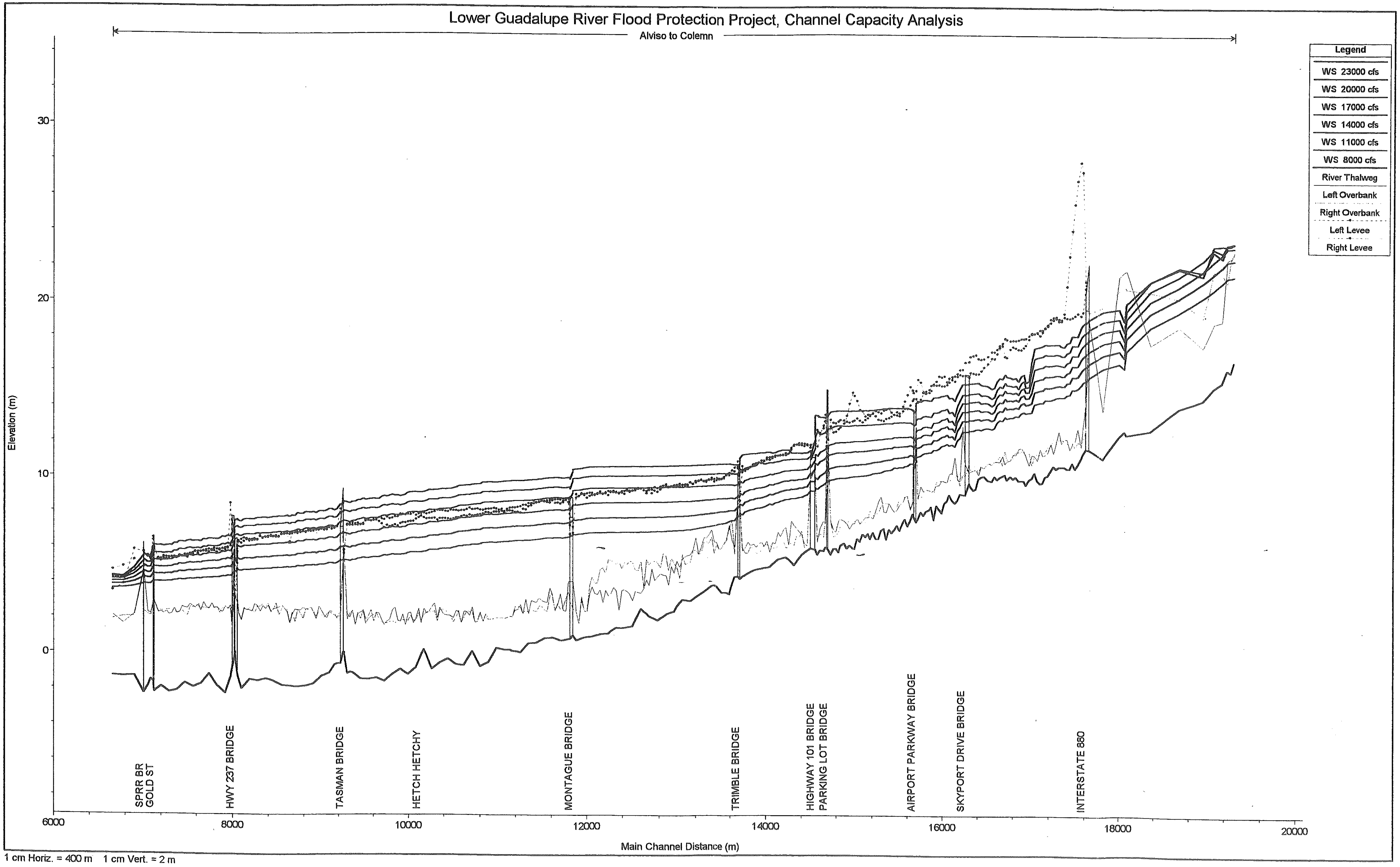
cm Horiz. = 600 m 1 cm Vert. = 2 m

Figure 21



1 cm Horiz. = 250 m   1 cm Vert. = 1.5 m

Figure 22



1 cm Horiz. = 400 m   1 cm Vert. = 2 m

Figure 24

APPENDIX A
SCVWD DIRECTIVES

(Directives will be included in this section once final versions are received from SCVWD)

APPENDIX A, SCVWD DIRECTIVES to be included in final version of NHC's Existing Conditions Report, History of Basin and Channel and Baseline Hydraulic Evaluation Report.

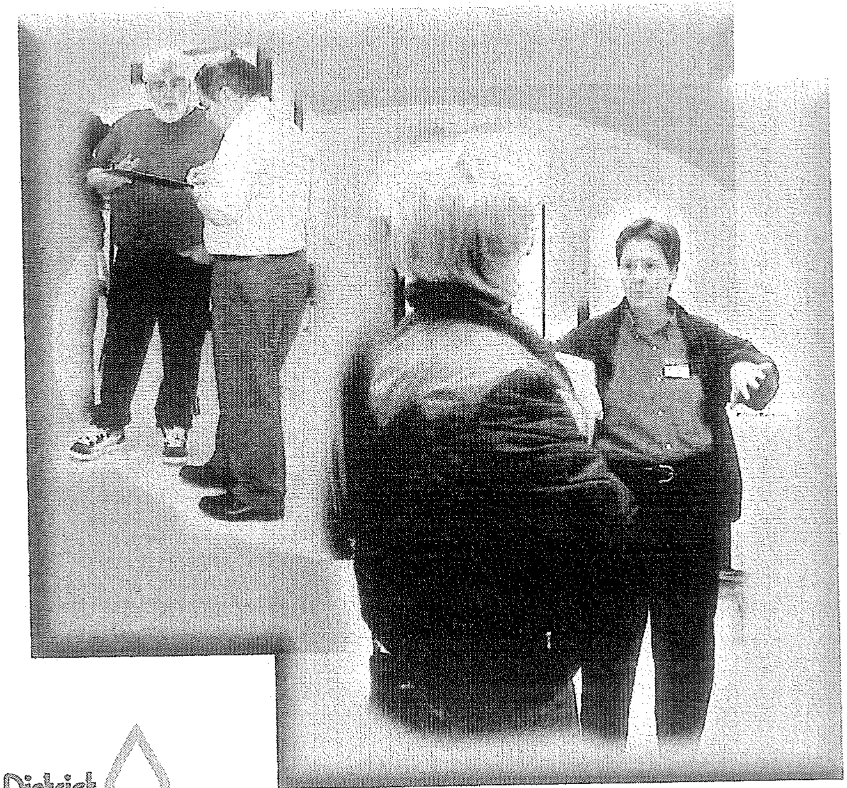
Appendix C

Appendix C
Public Outreach Plan

Report
August 2000

Lower Guadalupe River Flood Protection Project

Public Outreach Plan Preparation-Stakeholder Interviews



For District Use Only

Prepared for

Santa Clara Valley Water District
San Jose, California

Prepared by

CH2MHILL

Report

Lower Guadalupe River Flood Protection Project Public Involvement Plan

Prepared for

Prepared for Santa Clara Valley Water District
San Jose, California

August 2000

CH2MHILL

Executive Summary

This Public Involvement Plan has been developed to outline a comprehensive and proactive approach to inviting and responding to the public interests in the Lower Guadalupe River Flood Protection Project. With the assistance of many community members and special interest representatives, this plan outlines the project challenges, the public's views about flood protection and the opportunity for other improvements during the implementation of this project.

The organizations that were contacted generally fall under three categories: public citizens, business representatives, environmental representatives, and some government staff were contacted to verify recreational plans. The public issues identified and discussed in the plan include the following:

- Diverging views about the project objectives
- Distrust of government officials
- Objectives beyond the project scope
- Project schedule and funding constraints
- Communication barriers-multiple languages
- Receiving the public's attention
- Access to business representatives
- Coordinating convenient public meetings

The public involvement program described in this plan includes activities designed to address these public issues and these target audiences. The program includes a variety of activities, such as open houses, newsletters, telephone hotline, and stakeholder presentations. The plan implementation tasks, as defined in the contract, are the responsibility of CH2M HILL staff acting as representatives of the Santa Clara Valley Water District. CH2M HILL will be providing regular updates on the public contact activities. In addition, the public outreach activities will fold around the public involvement requirements of the California Environmental Quality Act and the National Environmental Policy Act processes that will be followed for this project. Attention is paid to the steps in how the decision making process and the public involvement activities will be integrated.

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        Benefits and Issues Affecting the Flood Protection Project 11
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Introduction

This Public Involvement plan has been developed to outline a comprehensive and proactive approach to inviting and responding to public interests around the Lower Guadalupe River Flood Protection Project. The Santa Clara Valley Water District believes that active public involvement during the planning process will increase the chances that an implementable project alternative will be identified, one that can both garner public support and meet the flood protection project objectives. This public involvement plan describes the water district's understanding of the issues and stakeholders (i.e., affected interests), at the outset of the study. This plan describes a program of activities to meet the flood protection project's broad goals and detailed objectives for public involvement.

This public involvement plan includes a project area description and project background. The plan is based on numerous interviews and research on the issues and benefits of the project to the community. Community interviews were conducted over February and March of 2000. The plan does not identify individual comments, but a list of those that were interviewed can be found in Appendix A.

The public participation activities identified in this plan have been organized to coincide with planned technical activities to allow for consideration of public comment in the project's technical and project management decision making. The schedule for the public involvement activities are subject to change as technical planning activities progress, however the schedule does meet the requirement to have all planning activities complete by Spring 2001. The Public Involvement Plan may be expanded once additional technical planning activities or additional community concerns reveal additional needs.

Project Description

The Santa Clara Valley Water District (SCVWD or water district) has the authority and has chosen to be responsible for flood protection from the Lower Guadalupe River. As a part of the overall mission to reduce the risk of flooding from the Guadalupe River, the water district has initiated a program to improve the level of protection along the Guadalupe River to handle 100-year flood design flows to meet national standards for flood protection projects. There are a total of three flood protection projects currently being planned: the upper, the downtown, and the lower Guadalupe River projects. This public involvement plan specifically addresses the Lower Guadalupe River Flood Protection Project; however, much of the information and resulting activities will be coordinated among all three projects.

Lower Guadalupe River Flood Protection Project Location

The limits of the Lower Guadalupe project are delineated in two sections, the project area and the overall project study/mitigation area. The project area extends between the Union Pacific Railroad (UPRR) bridge in Alviso and Interstate 880 near the southern end of the San Jose International Airport (SJIA). However, the project study/mitigation area encompasses the entire project area and extends beyond the UPRR out to the San Francisco Bay. Natural earth levees are constructed along the length of this project area extending from SJIA to the UPRR. Outside the levees, at the most northern end of the project area, the adjacent properties are lower than the water surface. The study area, extending north from the UPRR to the San Francisco Bay is characterized by the Alviso Slough, brackish marshlands, and salt production ponds operated by the Cargill Salts Corporation. The general description of this area is referred to as the Alviso Baylands.

The lower reaches of the river do not have typical riparian vegetation. The salt water from the San Francisco Bay influences the type of vegetation found in this portion of the river. More recently, there is less salt water influence due to fresh water outflows from the San Jose/Santa Clara Water Pollution Control plant, causing changes in the vegetation and wildlife habitat. The Baylands area, which includes shallow marshes and salt ponds between Alviso and the San Francisco Bay proper, is being studied to determine the extent of flooding that could occur from the numerous sloughs in the area.

The lower Guadalupe River is surrounded by urban development with a few small pockets of open land areas. This reach of the river passes through the Golden Triangle, where many high-technology research and development office buildings are located. In addition, several residential communities are located adjacent to the river.

Project Background

The Guadalupe River has a long history of flooding. Accounts of flooding from the Guadalupe River date back to 1777 when San Jose was established as a Spanish pueblo.

More recent significant floods have occurred in 1955, 1958, 1980, 1982, 1983, 1986, and 1995. In the 1950s, minor flooding occurred almost every winter with little or no resulting damage. As major land areas have subsided and additional development occurred, the damages have been more significant. For instance, in 1983, the Governor of California issued a State of Emergency Declaration and the President of the United States issued a Declaration of a Major Disaster for Public Assistance. This flooding primarily affected the Alviso area north of the UPRR bridge. In 1995, the Guadalupe River flows topped the banks affecting the downtown areas. Streets were flooded, transit operations were impacted, and the San Jose City Hall was evacuated.

The water district built the existing levees along the lower Guadalupe River in the 1970s. The same levees have since been raised twice. The problems that resulted from the 1995 storms indicate that the current channel is not able to carry flows associated with the 100-year design flood event. The water district, with cooperation from the U.S. Army Corps of Engineers, has initiated the three flood protection projects on the Guadalupe River to increase the carrying capacity to handle a 100-year design flood event in the most environmentally sensitive manner and reasonable cost.

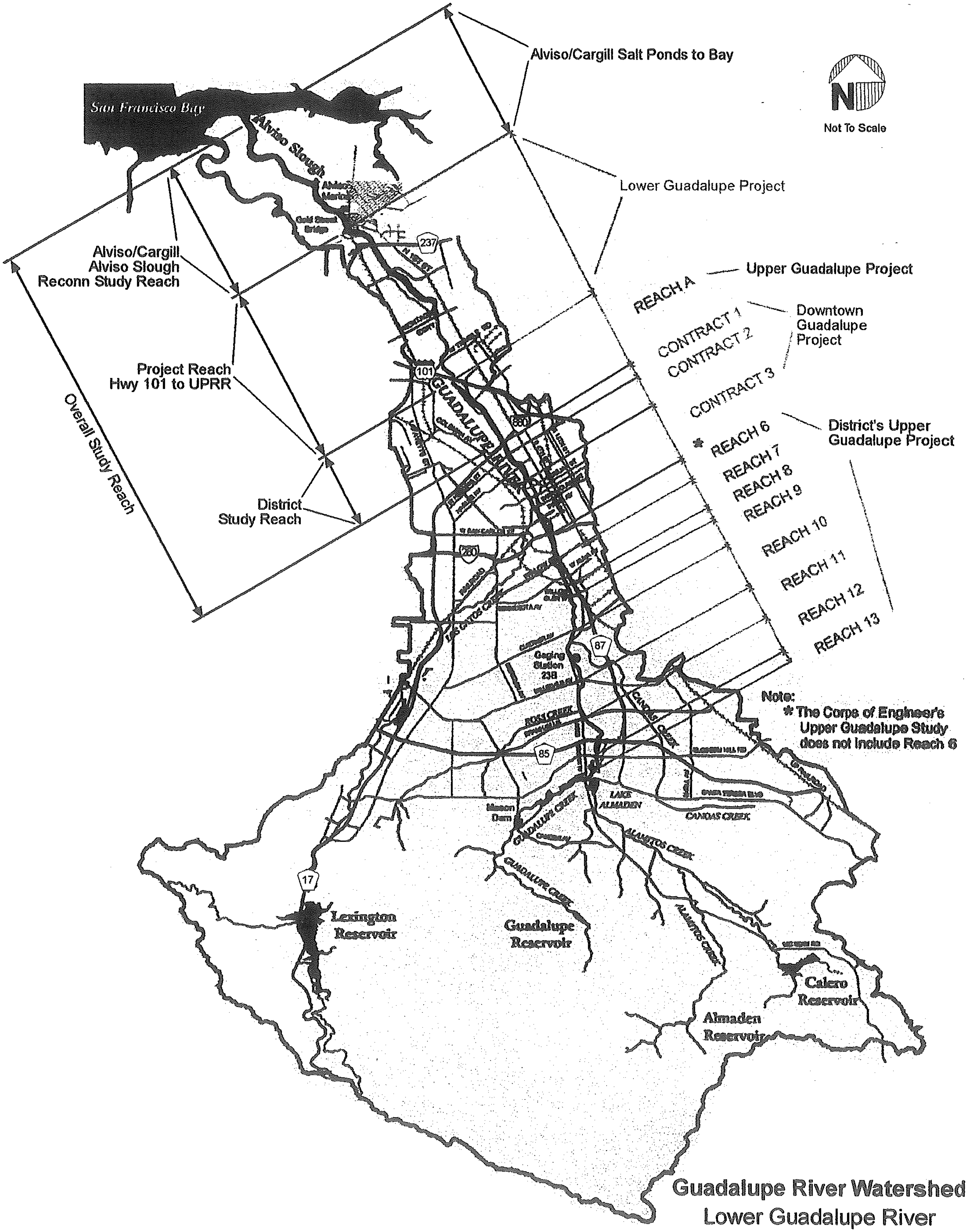
Project Involvement Activities to Date

During the initial development of the lower Guadalupe River's environmental and hydraulic baseline conditions, the Santa Clara Valley Water District sought to gather community input on the flood protection project. Activities to date have included:

- Project Newsletter, Flood Protection, Lower Guadalupe River Update #1 & 2, distributed in November 1999 and February respectively.
- Attendance at the WMI Flood Management Subgroup meeting on January 10, 2000, April 15, 2000, and June 5, 2000 to provide project briefings.
- Attendance at the organization meetings, such as the Guadalupe Coyote Resource Conservation District to provide project briefings.
- Individual stakeholder interviews with Alviso, San Jose, and Santa Clara residents, businesses, and environmental organization representatives.
- One open house was conducted to introduce, inform, and gain valuable public input on the project and the planning process. This first open house was held at the George Mayne Elementary School multipurpose room in Alviso. A scoping meeting was held at the Silicon Valley Conference Center in San Jose to satisfy the CEQA/NEPA processes. The scoping meeting was held within two weeks of when the Notice of Preparation was mailed and publicly posted. Both public meetings were announced by mailing notices to property owners and renters within the entire flood zone of the project area and all other addresses within 1,000 feet of the project area, advertisement in the newspaper, and media press releases. Two television stations sent crews to the first open house to report on the event.

These activities serve to announce the project, create interest in the project, and identify the public's concerns and issues early in the planning process.

Guadalupe River Watershed and Project Area Maps



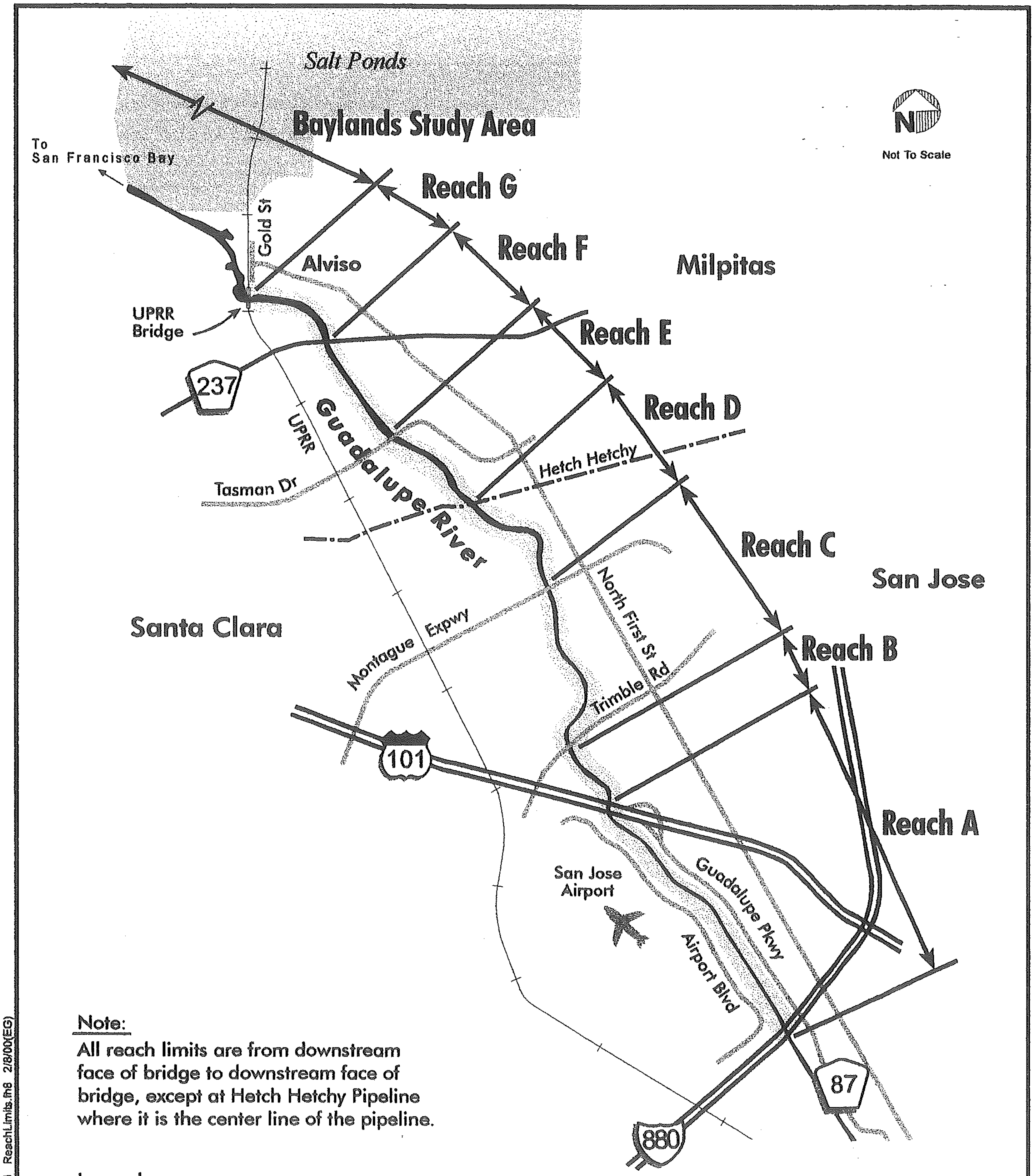
Note:
* The Corps of Engineer's Upper Guadalupe Study does not include Reach 6

Base map provided by Santa Clara Valley Water District.

148460.B1.ZZ SOQ\ Watershed.fh8 1/21/99(DVR)

Guadalupe River Watershed
Lower Guadalupe River
Flood Control Project

CH2MHILL



Note:
All reach limits are from downstream face of bridge to downstream face of bridge, except at Hetch Hetchy Pipeline where it is the center line of the pipeline.

Legend:

▨ Project Area

Reaches A-G and Baylands Study
Flood Control Project Area
Lower Guadalupe River Project

CH2MHILL

153735.04.01 ReachLimits.fh8 2/8/00(EG)

Community Assessment

The Lower Guadalupe River Flood Protection Project is not only about protecting people from the 100-year design flood event. The Guadalupe River is a significant natural resource that provides recreational opportunities, habitat for environmentally protected species, and visual relief from the built environment. People value these resources differently, resulting in differing viewpoints on how best to design and implement the flood protection project. Incorporating and addressing a wide variety of special interests and community concerns is the objective of the public involvement plan. This section of the plan identifies and analyzes community concerns and issues in order to provide the best public access to information about the project and opportunities for public input.

Community Profile

The Guadalupe watershed drains an area from the Santa Cruz Mountains to the San Francisco Bay, passing through many residential areas, downtown San Jose, and large business parks. Proceeding north from the urban center, the river divides the City of Santa Clara to the west from the City of San Jose to the east before entering the San Francisco Bay just past Alviso (see map on page 7).

The Lower Guadalupe River Flood Protection project limits are between the San Jose International Airport and extend north to the Union Pacific Railroad (UPRR) bridge in Alviso. The study/mitigation area of the project extends beyond the UPRR bridge to the San Francisco Bay (Alviso Baylands). The upstream portion of this reach includes residential communities, the San Jose International Airport, and research and development office buildings. The area to the north that is bounded by Interstate 880, Highway 101, and Highway 237 is commonly referred to as the Golden Triangle. The Golden Triangle is the home of some of the world's fastest growing and internationally recognized high-technology businesses. The strong growth of this industry in the last 10 years has brought a sudden stream of wealth to the area, resulting in quickly rising land values. The far northern (downstream) reaches of the river pass through the community of Alviso into the project study/mitigation area referred to as the Alviso Baylands.

The Santa Clara Valley Water District Geographical Information System database includes nearly 4,500 names and addresses of property owners and residents within the flood zone of the lower Guadalupe River. This does not include the daytime population that comes to work in the Golden Triangle through a web of heavily traveled roadways or the travelers accessing the San Jose International Airport. The residential areas are primarily concentrated in the City of Santa Clara and the community of Alviso.

Alviso has been annexed to the City of San Jose, but the long-time residents prefer to maintain the Alviso identity, which is part of the rich history of the development of the Santa Clara Valley. Alviso, once recognized as the gateway to San Jose, is the home of a largely Hispanic population of primarily Spanish-speaking residents. There are several long established businesses in the Alviso community, such as Vahl's Restaurant, whose owner is

92 years old and still serves her customers every day. This community has several long-time residents who remember the frequent floods that occurred in the 1950's and the complete inundation of 1983. This community has seen the agricultural industry and shipping activities come and go. Now, rising land prices are beginning to threaten new changes.

There are many residents who live on the southwest side of the lower Guadalupe River between the river and Lafayette Boulevard within the City of Santa Clara. Most of these properties are outside of the flood zone because the land elevation is higher or rather has not experienced as much land subsidence as the east side. These neighborhoods consist of a few condominium complexes, one single-family residential area, and one large apartment complex, called Mansion Grove Apartments. Research did not reveal any dominant minority groups or language barriers in these residential areas.

Interviews

Many people contributed to the development of this public involvement plan. A list of those individuals who were interviewed and the questions they were asked appear in Appendix A. In preparing this Public Involvement Plan, key public representatives were interviewed about:

- Experience with the water district
- Experience with flooding
- Opinion of the project
- Public outreach techniques

Interviews were targeted to research a wide range of viewpoints, including those of environmental special interest groups, residents, employees, and business representatives. More residents were interviewed to ensure we received a broad spectrum of public opinion. The details of the interviews will be kept confidential, but the opinions have been generalized to represent:

- Residents and, when specifically appropriate, Alviso residents
- Environmental interests
- Business representatives

When pertinent, City and County government staff opinions were recorded as well.

Community Issues and Benefits of the Project

Santa Clara Valley Water District Awareness

All interviewees were asked about their awareness of the roles and responsibilities of the water district. Everyone interviewed, except for some Alviso residents, were well aware of the water district and their responsibilities for water resources stewardship, providing flood protection, and protecting water quality. However, several interviewees stated that they felt that they were the exception to this understanding. This may be because the representatives were active members of the community, but the constituents they represent may not have access to the same amount of information. Several interviewees expressed this point in reference to generating support for future water district funding needs. Other people volunteered their insights as to how the water district could better advertise their contribution to the Santa Clara Valley. These ideas included:

- Advertise the environmental enhancement qualities of the flood protection projects
- Develop more interpretative information along the river corridors that explain the need for various aspects of the flood protection project and give the Water District credit for the project
- Present the projects as a quality of life improvement for those who would like to take advantage of the river corridor for recreational opportunities, shade, seating, open areas, and access to the water in key locations
- Continue to send guest speakers to various organization meetings to update people about what the Water District is doing
- Continue to have a presence at environmental and related conferences

Several people stated that, while they were aware of the water district's duties, they felt that the responsibilities should be expanded to manage recreational and educational opportunities as an umbrella organization that oversees the primary natural riparian corridors within the Santa Clara County. There were some clear differences between residents, business representatives, and environmental groups concerning the understanding of the water district. Some residents felt that the water district was merely a bill they paid or another government entity that could not be trusted. The business representatives generally supported the efforts of the water district, while the environmentalists were cautious about their opinions, but optimistic that the water district can and will implement more environmental enhancements than past project precedents.

Experience with Flooding

The interviewees had varying experiences with flooding, ranging from fleeing their homes in 1983 to traffic hazards on their way to work to virtually no personal experience. Those that did not have experience with flooding expressed a concern about the need for flood protection but, moreover, they were enthusiastic about how flood protection provided an opportunity to beautify the river corridor.

The residents of Alviso did have vivid memories from the last large inundation that they experienced in 1983. They felt abandoned by the local governments during this flood. Most Alviso residents were forced to leave their homes as the water rose more than six (6) feet high in some places, damaging their homes and belongings. Some long time residents remember that in the fifties, slight flooding occurred almost every year without compromising their homes. Since that time, the land area in Alviso, as well as other areas in the Santa Clara Valley, have subsided to below sea level due, in part, to over extraction of groundwater resources. Alviso residents remember the formation of the Santa Clara Valley Water District, and one interviewee helped the water district build the levees to contain high water flows. The levees have already been raised since they were originally constructed, and many Alviso residents feel that there is no remaining threat of flooding in their area, even though they still have to pay high flood insurance rates. Other comments from Alviso residents included:

- The project is being pushed forward by business interests.
- The water district cannot improve the situation until the lower Guadalupe River corridor is modified all the way to the Bay.
- Bridges are an ongoing constraint to flow carrying capacity for this river corridor, specifically the Trimble Road Bridge and the bridges in Alviso. Several individuals in Alviso believe that the two bridges in Alviso will obstruct river flows, thereby further threatening Alviso.

Other residents within the flood zone were less worried about flooding, mainly because of little experience with flooding on their properties. However, upon further conversation, people do recall various times when roads were impassible. These memories created fear and concern about personal safety. People wanted to be assured of a safe commute and that the City pumps were going to be operating when necessary.

Business representatives are very aware of the threat of a flood and expressed their concerns accordingly, but few could impart personal experience with flooding in this area, except Alviso businesses. Alviso business owners who were interviewed have a very resilient attitude. "A flood may come, but it won't last forever… my business will" said one business owner. The Research and Development business representatives had a different position. They were not concerned about cost or temporary traffic obstacles, but anything that could jeopardize business activities was a very serious issue. The expressed concerns of these businesses include:

- Any physical property or assets damage caused by flooding could halt production, which is worse than the cost it takes to replace the equipment
- Inability of workers to travel to the office due to flooding
- Long-term damage to the roads, causing long traffic delays during repairs

Businesses in the Golden Triangle are aware that they are within the flood zone, but the general understanding is that flooding occurs only when the City pumps do not work properly, causing water to accumulate in the streets. The high-technology businesses are not concerned about the cost of flood insurance, only the costs of delaying the "just-in-time delivery" of their products to market and therefore regardless of the cost, flood damage is more an issue of determining business success rather than reimbursing damaged goods.

Environmental representatives conveyed varying views and experiences with flooding. Several felt that flooding was a needed, natural event to rejuvenate native species of plants. Others recognized the need for flood protection, but felt strongly about creating a long-term vision of acquiring an expanded land area to return the river corridor to a more natural meandering corridor. When asked about the impact of flooding on people, the environmentalists were sympathetic to the safety factors, but would prefer if commercial and residential developments would restrain from building within the flood zone so that natural river processes could be allowed to occur.

Benefits and Issues Affecting the Flood Protection Project

Each of the interviewees was asked about the benefits and/or concerns this project would bring and the organization(s) they represent. Interviewees had different perspectives on issues concerning the Guadalupe River. For many, this project represents much more than merely flood protection. Several environmentalists view the river as a wildlife corridor that should not necessarily include access for human interaction. Several residents and park-oriented agencies define the Guadalupe River as a valuable resource to connect the public to the natural environment via trails, fishing, jogging, and interactive experiences for all ages. Business representatives also support these activities as a way to improve the quality of life for their workers. Still others view the Guadalupe River as potential functional water transit corridor for yachts, ferries, and cargo. Therefore benefits and concerns were centered around the interviewee's particular perspective on what and whom the river should serve. Many interviewees used the opportunity to convey their hopes for the project. The concerns and opportunities discussed generally fell into the following categories:

- Project costs
- Project delivery
- Environmental
- River enhancements and aesthetics
- Traffic

Project Costs

According to those interviewed, cost should not be a significant factor in choosing the best alternative. In fact, many took liberty to suggest additional features that the project should include, knowing that they would add costs. Additional comments included:

- A long-term solution should be sought to make this the last time the water district needs to modify the river carrying capacity.

- Budgets and plans should include the ability to regularly clean the channel.

- Some environmentalists differed slightly by adding that there should be a substantial project that satisfies the flood protection and environmental criteria, but also, they would like to encourage a long-term vision where a wider band of land area can be acquired as part of long-term redevelopment plans. The purpose of this vision is to return the river to a more natural state, permitting sediment to deposit where it will and providing opportunities for the river to meander.

Project Delivery

The duration of construction concerns the business representatives more than any other interviewee groups. In light of the time-sensitive nature of the high-technology companies, the interviewees were surprisingly understanding about the possible traffic impacts this project could cause during construction. Many of the business representatives felt that the gains of flood protection will outweigh the impacts on traffic. Several people stated that traffic can hardly become more congested. Residents just want to see progress, and discussions seem to make them feel like the water district is procrastinating. The following comments convey their concerns about construction:

- Provide flood protection without damaging the roadways, causing years of traffic problems.
- Public agencies and businesses wish to maintain strong communication linkages about each step of the project so that other project and business routines can accommodate accordingly. Businesses were clear that facility supervisors and environmental managers would need to be involved when construction begins. Communication lines are the lifeblood of these businesses. Any construction schedule should accommodate coordination time to work closely with affected businesses.
- Businesses will be most sensitive about reconstruction of bridges that cause traffic delays on major facilities.
- Residents expressed frustration with the lack of activity toward project completion. The comment was, "Do not talk about the plans, show us what you will do and then do it." Several residents are upset about how the environmental constraints cause long delays in the process.

Environmental

Protecting the environmental values of the river was frequently mentioned among all groups. Comments ranged from frustration about how environmentally sensitive habitat was a poor excuse to leave people in jeopardy of being flooded to desiring to permit river floods to allow the natural habitat to flourish. The interviewees all mentioned that working within environmental constraints are important, as long as the process could continue toward a workable solution. Environmental considerations included:

- Purchase Cargill Salt ponds and return the alluvial fan potential and permit the tidal prism to interact with the river dynamics.
- The chosen alternative should represent the least impact to the natural habitats, which includes preserving riparian vegetation and setting back the levees as far as possible.
- There is a movement to make this stretch of the river a priority to enhance and restore as a Bay Area North American Waterfowl habitat.
- Several interviewees were concerned about how this project was being coordinated with other projects in the watershed and the interrelated issues between projects, such as mercury contamination.
- Many pointed to the wastewater treatment plant located east of the Alviso Slough as the primary contributor to the change in environmental habitat. This facility has changed the slough water mixture from primarily salt water to more brackish water with lower salt concentrations. The fresh water has changed the type and volume of vegetation growth where the salt water used to prohibit growth.
- One Alviso resident expressed support for environmental preservation to strengthen the fishing and hunting components of the river corridor.

River Enhancements and Aesthetics

Environmental, recreational and other aesthetic enhancements to the Guadalupe River were the focus of many of the interviewee's comments. Interviewees used the opportunity to promote their ideas about what the Lower Guadalupe River Flood Protection Project should include. Except for some environmental interests, almost everyone interviewed expressed a desire to maintain public access to the River. Comments generally were as follows:

- Educational enhancements, such as interpretative signage, places to interact with the river, and the function of the river and flood protection elements, should be an integral portion of the project. It is essential to explain to people why the project is necessary and what is involved to provide flood protection.
- Business representatives maintained that there are economic as well as political gains that could result from aesthetic and recreational enhancements in this project. As work force becomes scarce, and workers are demanding more from job locations, quality of life attributes are playing a heavy role in job retention. These interviewees felt that extra amenities on this project could result in promoting the water district projects and funding resources. *Quality of Life contribution could include trails, seating areas, vegetation, view platforms to watch fish ladders, separated trails for joggers and bicyclists, etc.*
- The local government agencies, including the Valley Transportation Agency, seek to collaborate with the water district regarding the compatibility of trail features with the flood protection project, because the current plans are to have trails on both sides of the river and the additional pedestrian/bicycle bridge.
- One subgroup of the Alviso community consists of boating enthusiasts, who remember when the South Bay Yacht Club was a thriving port of call for yachters and ferryboats. This group is closely watching the ferry transit movement and will be interested in this project to improve boating recreation and water transit opportunities.

Traffic

Traffic congestion causes stress on people and yet, when specifically asking interviewees about traffic, there is a general acceptance of how construction of a project affects traffic flow. Interviewees mentioned the need for advanced notice of traffic impacts. Some business representatives explained that work and delays on bridges are sensitive issues, but admittedly, the bridges need to be enlarged to eliminate the constraint on the river's flow capacity. Business representatives are sensitive to the duration of construction and the resulting impacts on traffic congestion and emphasized the need to be as efficient as possible. Comments can be summarized as follows:

- Traffic impacts cannot be made worse than existing conditions, and the benefits will prevent future destruction to the circulation system.
- Traffic rerouting and roadwork should be preceded by advanced notice to all affected businesses.
- Avoid taking a bridge out of circulation, unless it is north of Route 237.

- Flooding on the roads is a greater concern than temporary construction impacts because of the lasting effect of destroying the road surface. Providing flood protection will avoid the more severe long-term effects that a flood will have on our roadways.

Public Outreach

The final subject that was addressed with interviewees was how to best deliver updates and maintain open lines of communication throughout the project duration. Everyone interviewed, except the business representatives, said that they were receiving the newsletter and the announcements sent via mail. Most people were satisfied with this form of personal notification. Reaching appropriate business representatives is not as easy because, unless the mailer is addressed to someone specific, the mailer is viewed as advertising material and the messages are not delivered to the appropriate contact. Some business organizations have offered their e-mail distribution lists and space in their newsletters to send out information to their members. In terms of meeting attendance, this group is very hard pressed to make time for more meetings. Suggestions from business representatives included making visits to:

- Pacific Industrial Businesses Association
- Silicon Valley Manufacturing Group Environmental Sub Group meetings
- Alviso Rotary

The environmentalists had other concerns. They want an opportunity to have a roundtable discussion where a dialogue can be developed between them and the project team members. Other organizational representatives other than the environmental groups were also amenable to such a discussion.

Some residents felt that a web site could be used to communicate project details. Other residents felt that the newsletter was easily placed in the junk mail category and discarded before it is opened. They suggested that if the news was very important, then the announcement should come in an envelope. Envelopes typically warrant more attention, and the likelihood of being read is greater when the newsletter is sent in an envelope.

Both Santa Clara and San Jose have major public works projects near or along the River corridor. The city, state, and federal government representatives are all on the mailing list, but it may be appropriate to attend City Council meetings in both San Jose and Santa Clara to ensure that these representatives have an opportunity to provide their input on the project. City and County staff have offered to use their own internal communications systems to ensure that meeting announcements and regular updates would reach people's email.

Analysis of Community Issues

The goal of the Lower Guadalupe River Flood Protection Project—to provide flood protection—is perceived as a benefit, but not as great as other opportunities. The perceived opportunities and benefits are summarized as follows:

- Recreational opportunities, including trail construction and other enhancements

- The opportunity to coordinate environmental enhancements through all three river projects (upper, downtown, and lower river projects)
- The chance to plan educational elements in the design
- Improved aesthetic qualities of the river, thereby increasing the overall quality of life for the workers and nearby residents

In addition to these tangible benefits, there are intangible benefits to the Santa Clara Valley Water District through the timely implementation of this project. Several representatives expressed a distrust of the environmental review process and the ability of the government entities to communicate with the public. This project can be an example of how all comments are heard, incorporated and worked through in an efficient manner. This project can illustrate the breadth of services the water district offers the prominent high tech business sector of the Santa Clara Valley as well as the residential groups.

Each of the three representative categories, residents, businesses, and environmentalists, differ on what aspects of the project concern them. Their concerns are not necessarily based on opposing values although, as mentioned earlier, the residents are not always sympathetic with the environmental issues and the perceived delays that the environmental review process has on the project. One similarity among the residents of Alviso and the environmentalists is the partial solution to purchase the Cargill Salt ponds and redirect the river channel to reach the San Francisco Bay by avoiding the Alviso Slough. The environmentalists will closely watch the maintenance of a comprehensive work plan and coordination with other efforts along the river. They will also push for a long-range plan to widen the river and restore the river's natural inclination to meander, deposit sediment along the riverbanks and develop riparian vegetation.

The residents in Alviso are angry at government agencies. They are very sensitive regarding broken promises and follow through on project objectives. They have felt that government agencies have taken the Hispanic community for granted with low standard of service delivery and diminishing amenities for their youth. Alviso residents are beginning to see their property values rise and they are concerned that their community will be pushed out by businesses with larger purchasing power. The residents believe this project will make it easier for businesses to develop the land, rather than provide flood protection for residents.

Finally, the local government representatives primarily welcome the project with the caveat of the project accepting the local street storm runoff and compatibility with other projects, such as trails, pedestrian bridges, and improvements to the County Marina.

Public Involvement Challenges and Goals

The community interview process and the open house introduction to the project identified several key project development challenges for the Lower Guadalupe River Flood Protection Project. These challenges are discussed here and form the basis of the public involvement goals for the project.

Public Involvement Challenges

Diverging Views about Project Objectives

The Guadalupe River is a very visible amenity to the cities of San Jose and Santa Clara. The river concerns many entities with diverging interest in the use of the natural corridor. From returning the river to natural state to a deep water channel built to handle ferry transit, the interviews identified several objectives that are not currently included in the water districts plans. Some interviews communicated opposing project objectives. There are strong reasons why these bold project objectives cannot be pursued. The public involvement process will have to clearly chronicle the methodology used to determine the preferred solution and addresses each interest's ideas.

Distrust of Government Officials

Past experiences and the proclivity of residents to group government agencies implies that the Water District will have to face scrutiny from angry Alviso residents, regardless of the Water District's role in prior events. Alviso residents expect poor communication and patronizing attempts to please their requests with no follow through. Targeted and concentrated information campaigns will need to blanket the residents as well as the business interests of Alviso. Messages should be clear, consistent and conscientious of the ability to deliver prior to making promises. Trust must be built up one step at a time.

Objectives Beyond the Project Scope

While interviewees were supportive of the flood protection aspect of the project, the overwhelming focus from interviewees is on river enhancements and recreational opportunities of the project. Preliminary evaluations of the baseline conditions and hydraulic projections for the 100 year design flow illustrate that increasing the river's capacity may require modifications that do not meet the desires of the interviewees, like the use of walls and taller levees. The Water District policy does include designing projects compatible with recreational opportunities, but the number one design objective is to provide flood protection. Currently, the cost of enhancements and recreational opportunities are beyond the limits of the current budget. The public outreach objective shall address the potential of these enhancements, and keep communication open so that possibilities can be recognized and the momentum can be sustained to attract cooperation with other agencies and funding resources.

Project Schedule and Funding Constraints

The Lower Guadalupe River Flood Protection Project must meet key deadlines and be completed by fall 2002 if the water district is going to meet their contractual obligation to provide capacity for the Downtown project river flows. The public is seldom sympathetic to these issues, when objections are raised on the project development details. The Public Outreach Plan must be thorough and responsive in order to foresee any public concerns that may affect the critical path. Funding constraints may be one item that causes the public to be dissatisfied with the project if certain improvements are not shown to be integrated. Recording public's desires and validating opportunities for future improvements will provide the public with meaningful goals to work towards.

Communication Barriers-Multiple languages

Work opportunities in the Santa Clara Valley have attracted many residents of different ethnic and cultural backgrounds. Many area residents do not speak English. Alviso is known as a primarily Hispanic, Spanish speaking community and therefore all public outreach materials will be translated into both Spanish as well as English. However, interviews revealed that, in addition to only speaking Spanish, many have low literacy rate, making it more important to have translators available for all presentation events.

Receiving the Public's Attention

One disconcerting issue arose when interviewees explained that they had not received the first introductory newsletter or the public meeting announcement. Records indicate that they did indeed receive these mailed materials, but the information was not absorbed. It is not uncommon for residents to receive a number of agency newsletters and promotional materials. The shear quantities of these materials appear to result in reduced attention from the recipients. A noticed in an envelope will often receive more attention because of the appearance of being a bill. The newsletter media offers recipients graphically engaging media with easy to read articles, visual imagery for easy understanding and therefore provides more information than can be sent in an envelope. The purpose and intent of the mailer should be evaluated for the content of the information.

The public outreach should take advantage of resources available such as other newsletters and e-mail distribution lists that target particular interest groups. People are more apt to read the newsletter that they know than a new newsletter that may be mistaken as promotional materials. Members are likely to read and trust the information in their organization's own newsletter because they are more familiar with the newsletter production staff. This coordination also indicates a responsive outreach program. While more may come available over time, those newsletters and information networks that were offered during the research for this Public involvement plan include:

- Northside Residential Homeowners Association
- Alviso Rotary Newsletter
- Pacific Industrial and Business Association
- Santa Clara County Recreation Department internal E-mail communication

- San Jose Silicon Valley Chamber of Commerce
- Silicon Valley Manufacturing Group - Environmental Sub Group via e-mail distribution and Newsletter
- League of Women Voters
- Building Official Management Association
- Fall annual Audubon Newsletter

Access to Business Representatives

Another hurdle to effective public outreach is reaching the appropriate business representative that this project concerns. There does not seem to be an easy way to discover the names of facility mangers for the large office buildings within the Golden Triangle. These managers rarely belong to trade associations and many times, other workers in the building cannot easily identify them. Also, mailers are sent to property owners because the addresses were taken from the county assessor's office. Property owners are rarely affiliated with the businesses using the building and therefore mailing distribution do not include all the businesses. The businesses will have to be reached through multiple public outreach activities to develop awareness. Once people become aware of the project, the typical public outreach tools will become useful.

Coordinating Convenient Public Meetings

Attendance at public meetings can determine the effectiveness of a public outreach project. The Lower Guadalupe River Flood Protection project is over six (6) miles long. The river is adjacent to several land uses, including one of the fastest growing business sectors of the 21st Century. The convenient time to hold a public meeting is different for different interest groups. For instance, it is customary to schedule public meetings in the evenings after residents have enough time to come home from work and eat dinner. However, this project affects an important and large number of high tech research and development businesses. These individuals favor going to a meeting on the way home from work or during the day and therefore an earlier scheduled meeting may attract more participation from this group. Public meetings need to have displays that communicate clearly in a short amount of time, so that people can come and go conveniently.

Public Outreach Goals

Based on the challenges identified for the Lower Guadalupe River Flood Protection Project, the following goals have been established:

- Inform the general public and special interest stakeholders about the potential benefits of the project.
- Create a variety of outreach activities that build early awareness of the project so that issues can be addressed and incorporated in the planning process, thereby maintaining the schedule.

- Solicit ideas and respond to concerns from the general public and special interest stakeholders on the proposed project features.
- Provide clear concise information about the project, its goals, and the process for choosing preferred alternatives.
- Use familiar communication networks and newsletters to distribute information, thereby reaching people within their area of interest using methods they trust.
- Develop opportunities for the divergent interest groups to have open discussions of issues directly related to the Lower Guadalupe River Flood Protection project.
- Maintain open lines of communication with other affected agencies to improve coordination efforts and build interagency cooperation.

The public involvement activities described in the next section will help ensure that these goals are met and that the public has opportunities to provide input to the selection, design, and construction of the Lower Guadalupe River Flood Protection Project.

Public Involvement Activities and Tools

The public involvement activities described in this section have been developed to achieve the goals described in the previous section and to encourage interested groups and individuals participation in the evaluation of the flood protection project.

Public Involvement Activities

The following public involvement activities are designed to encourage communication of project information among interested groups and individuals. The objective of the public involvement activities are to encourage people to offer their input in the planning phases of the project and gain their support for the chosen flood protection project alternative.

The public involvement program will be successful if interested parties understand the preferred alternative, trust the process of selecting an acceptable project alternative, and feel that their comments were listened to and incorporated when possible. To some extent, the success depends on providing appropriate materials to fit the special needs of the interested parties, from Spanish translation to extended hours at public meetings to grant all interested parties equal access to the information.

In addition to the public outreach efforts described below, the water district continues to maintain the internal communication between the other Guadalupe River projects. The Santa Clara Valley Water District Board members receive regular updates in the General Manager's Bulletin. Additionally, the water district provide verbal update reports to the Citizen Zone Advisory Committees (The Central/North Central and the East Zone Advisory Committees).

Task 1— Updated Agency Stakeholders through the WMI Flood Management Subgroup

Purpose: Keep regulatory agencies updated about the project and use the forum to test the acceptability of the preferred alternative in the development stages.

Description: Attend and update agency representatives, involved in the Watershed Management Initiative, Flood Management Subgroup meetings. Regulatory agency representatives that will be responsible for reviewing the Environmental Impact Reports are already present and working on similar flood management issues within this subgroup and therefore this forum provides a convenient opportunity to reach several stakeholders at once. Project team members will present regular updates to the Flood Management Subgroup at key milestones in the planning process. (See PI schedule chart in Appendix B). There are an estimated four (4) meetings which will generally correspond with introducing the project and baseline information; once a list of alternatives have been developed, once the preferred alternative has been identified, and prior to distributing the Draft Environmental Impact Report.

Implementation: CH2M HILL with assistance from Santa Clara Valley Water District

Participants: WMI Flood Management Subgroup

Schedule: Meetings will be held as needed. The WMI Flood Management Subgroup meets the third Monday of every month. Presentations will generally follow key milestones for the project, such as the developing a set of project alternatives, the narrowing to a preferred alternative and the analytical results from the environmental impact analysis.

Task 2—Conduct Individual and Customized Stakeholder Meetings

Purpose: Develop customized presentations to provide identified stakeholders with an opportunity to understand the project and provide valuable input.

Description: Through the interviews, several additional stakeholders and groups of interested parties were identified. As part of the outreach effort, the project team will attend regularly scheduled meetings or establish a convenient meeting to seek additional input on the project alternatives.

Implementation: CH2M HILL with assistance from Santa Clara Valley Water District

Participants: The target groups include:

- A tour and roundtable discussion for environmental interests.

  This event was arranged and conducted by CH2M HILL on June 5, 2000. This group included an assembly of environmental interest groups, recreation interest groups, property owners, and government agencies. A discussion was facilitated by CH2M HILL that exposed the varying viewpoints and commonalties between these groups.

- Two meetings with the Mujere Latina Discussion Group.

  One meeting with this group was conducted on January 20, 2000. Members of the group were involved in a facilitated discussion by CH2M HILL. In order to ensure full participation by the group members, Spanish/English translation services were provided.

- The Coyote Guadalupe Resource Conservation District.

  Two meetings have been conducted with this group on February 28, 2000 and July 17, 2000. Each meeting included a presentation by CH2M HILL and discussion on the project's current status. Detailed question and answer periods were provided with the group to obtain their concerns and objectives related to the project.

- Downtown Collaborative

  Two presentations have been given to this group providing an update and issues on the Lower Guadalupe Project. The meetings were held on April 13, 2000 and July 27, 2000. CH2M HILL presented the projects' current status and responded to questions.

- The Alviso Rotary Club.

  This presentation was held on July 12, 2000. CH2M HILL presented the projects' current status, potential alternatives, and responded to questions.

- The Silicon Valley Manufacturing Group-Environmental Subgroup.
- The Pacific Industry and Business Association.

Schedule: Several of these meetings are held during the summer of 2000, before the preferred alternative has been selected.

Task 3—Public Meetings

Purpose: Provide an informal forum for community members to receive project information, ask questions and express concerns.

Description: Community meetings in an open house format will be scheduled in convenient public locations along the lower Guadalupe River corridor. Each public meeting will provide a three (3) hour time period for the community to drop by to view project maps, information, and engage in various activities such as videos, slide show, or questionnaires to elicit comments and input about the project. Open House meetings are above and beyond the meetings required for environmental review. The open house will include a sign-in table and information stations located around the room. Each station will have a visual display and project specialists to answer questions.

Implementation: CH2M HILL with assistance from Santa Clara Valley Water District

Participants: General Public

Schedule: The initial open house to introduce the project was held January 27, 2000. This meeting was held in Alviso. In Fall of 2000, an open house meeting will be specifically planned to receive input from the public on which alternative should be the preferred alternative. Additional public meetings will be held for the CEQA/NEPA process (see Task 4).

Task 4—Public Hearing and Public Comment Period

Purpose: Provide opportunity for official recording of public comments and written responses to comments received during the public comment period in accordance with the CEQA/NEPA process.

Description: A total of three required public meetings (scoping meeting and two public hearings) must be held in accordance with the CEQA/NEPA process requirements corresponding to the project scoping session, the draft environmental impact report and the final environmental impact report. The public hearing will be a standard District Board meeting format, including:

- A brief presentation to the Board by District and/or consultant staff;
- A formal public comment period;
- District Board question and answer period;
- Board action if appropriate;

The written and verbal comments received during the official public comment period will be grouped and organized by topic. This project has integrated both the CEQA and NEPA environmental permitting processes. Therefore, each comments or questions on the draft reports will receive proper response. Responses will be prepared as an appendix to the Final EIS/EIR.

In addition, incorporating input at key stages ensures affected stakeholders and concerned public agencies comments are considered in the decision making process. Responsiveness to the public's comments and concerns is critical. The public can see how their input is incorporated into the project through continuous updates in the project's newsletter and public meetings/open houses.

Implementation: Jones and Stokes Associates and CH2M HILL with assistance from Santa Clara Valley Water District

Participants: General Public

Schedule: The scoping meeting outlining the range of alternatives was held on May 3, 2000 at the Silicon Valley Conference Center, San Jose. The next step of the environmental process includes two CEQA/NEPA mandatory public hearing meetings, one to review the Draft EIS/EIR in Fall 2000 and then another public hearing to receive comments on the Final EIS/EIR in Spring 2001.

Written comments received during the Notice of Preparation (NOP) public comment period as well as from the first public meeting have been summarized and incorporated into the project's decision-making criteria.

Task 5—Prepare and Maintain Stakeholder Matrix

Purpose: Develop and maintain a list of interested individuals and organizations including those properties adjacent to the lower Guadalupe River Project for notification and information distribution.

Description: A decision was made early to include all residents and property owners within the 100 year flood zone as defined by the water district (which extends beyond the Federal Emergency Management Agency 100 year flood zone definition). This list is referred to as the Public Mailing list. In addition, a list of public representatives, special interest organizations and interested individuals have been collected to add to the mailing list matrix.

Implementation: CH2M HILL with assistance from Santa Clara Valley Water District

Participants: The total matrix includes:

- Property owners, renters and businesses within the 100 year flood zone.
- All public officials responsible for the Santa Clara County including federal, state, county, city representatives (elected and staff) and key members of the Santa Clara Valley Water District.
- Environmental and other special interest organizations
- Members of the Guadalupe Park and Garden Committee and Downtown Collaborative
- All members of the Watershed Management Initiative
- Chambers of Commerce for Alviso, Silicon Manufacturing Groups, Hispanic community businesses
- Attendees at the public meetings

Schedule: Ongoing additions and deletions after each mailing and public meeting to make sure that all interested members of the public are included.

Task 6—Project Hotline

Purpose: Provide convenient customer service for project related questions.

Description: A hotline offers a personal connection and customer service that can resolve people's immediate questions or resolve minor confusions. All phone calls go to a voice message machine provided by the Santa Clara Valley Water District. The voice message requests the caller state their name, their phone number, the information request and the most convenient time to return the call. It also states that the call will be returned within 24 hours of receiving the call. When possible, the requested information is sought before returning the call so that the customer gets the information without delay.

Implementation: Santa Clara Valley Water District will provide the telephone number and voice messaging service. CH2M HILL will have primary responsibility for managing the hotline.

Participants: General Public

Schedule: The Hotline will be checked each business day throughout the planning portion of the project and twice each business day within two weeks before and after holding a public meeting. Meeting announcements attract more calls.

Task 7—E-mail and Newsletter copy to special interest newsletters

Purpose: Provide written updates about important project issues and upcoming meetings to key agencies' newsletters and e-mail distribution lists.

Description: Brief updates and announcements will be prepared and distributed to local organizations to incorporate in their information distribution program. The updates will help to reach out to special interest groups and business representatives that are difficult to reach via other outreach activities.

Implementation: CH2M HILL with assistance from Santa Clara Valley Water District

Participants:

- Northside Residential Homeowners Association
- Alviso Rotary Newsletter
- Peninsula Industrial and Business Association
- Santa Clara County Recreation Department internal E-mail communication
- San Jose Silicon Valley Chamber of Commerce
- Silicon Valley Manufacturing Group-environmental Subgroup via e-mail distribution and Newsletter
- League of Women Voters
- Fall annual Audubon Newsletter

Schedule: With the development of any project newsletter and public meeting announcement, a brief update will also be sent to these organizations.

Task 8—Project Newsletters

Purpose: Provide written project updates to all interested members of the public on the mailing matrix and at identified distribution locations.

Description: A project newsletter will be prepared generally on a quarterly basis and in correspondence to important project events to describe project progress. The newsletter will include information about public involvement activities, public concerns, project progress, study results and opportunities for public comments. The newsletter will be distributed via first class mail to each address on the mailing matrix. Additional copies will be placed at key kiosks within the project area, such as the Alviso Library, the health clinic, the school and at some restaurants. Newsletters will also be distributed when possible at other related stakeholder meeting presentations and one Sunday following the production of the newsletter after mass to reach additional community members in Alviso.

Implementation:	CH2M HILL with assistance from Santa Clara Valley Water District
Participants:	Project Team
Schedule:	There will be four newsletters produced over the span of the planning process. They will be produced quarterly, the first having been distributed in December 1999.

Task 9—Project Web site

Purpose: Provide easy access to the project background information, meeting summaries, and upcoming project events to the public.

Description: One web site will be developed featuring three flood protection projects on the Guadalupe River all of which are currently in the project planning phase. The projects are the Upper, the Downtown and the Lower Guadalupe River Flood Protection projects. The Lower Guadalupe River project will include:

- Current Project Description (Project description with Mission and Vision)
- Map of the Lower River Project with flood zone-perhaps the ability to enlarge sections of the river where info for that section could discussed (three sections)
- Project area photographs
- Schedule and Bulletin of upcoming events
- How to Stay informed
- Frequently Asked Questions
- Newsletter text by edition number
- Public Meetings: Announcements for upcoming events, past Open House Meeting summary and a few photographs
- Announcements for Upcoming events

Implementation: Santa Clara Valley Water District will provide the server and technical graphic site creation. CH2M HILL will provide the design concepts and content information.

Participants: Project Team

Schedule: Frequent updates to the web site will occur as information comes available.

Task 10—Power Point Presentation

Purpose: Provide an adaptable power point presentation of the project planning process and incorporate alternatives and evaluation results as available.

Description: A short power point presentation will be designed to be flexible and adaptable for different stakeholder meetings and group presentations. The power point will include the existing baseline conditions, the project constraints and as developed, the project alternatives and evaluation material. The power point format is convenient for the presenter to offer visual relationship with the material being presented and thereby inspiring more comments and questions from the listeners. In addition, the power point will be distributed in black and white Xerox to the viewers so that they can refer to the presentation materials easily.

Implementation: CH2M HILL with assistance from Santa Clara Valley Water District

Participants: Stakeholder meeting members (see Task 2)

Schedule: The power point will be updated at key milestones with the progress of the project. They will be the data gathering stage, the alternatives development stage and the Draft Environmental Impact Report evaluation stage.

Task 11—Project Brochure

Purpose: Develop a hand out describing the Guadalupe River flooding problems, the three flood protection projects, the project development process, the environmental review process, the future benefits, and the expectations of the project construction periods.

Description: A three fold, glossy, two-color brochure will provide a summary of all three flood projects for the general public. The intent of the brochure is to continue to offer general information about these projects, the process of determining the preferred alternative and the eventual benefits. It will also list ways to receive more information for each project. The brochure will provide resource information. The brochure will help to illustrate the connection between each of the projects and the order of project delivery and why.

Implementation: CH2M HILL with assistance from Santa Clara Valley Water District

Participants: Project Team

Schedule: The Brochure will be produced once during the preparation of the Final Environmental Impact Report.

In summary, many public outreach activities should be carried forth in future phases of the project, such as the web site updates, the newsletter, the hotline, the occasional project updates to key organizations. As gleaned from the interviews, a more targeted outreach program will be needed for the construction phase of the project in order to have consistent communication throughout project delivery. The program will define which business representatives should be updated regularly and which may only need occasional information updates. Any infrastructure relocations (i.e., bridges, & utilities) that impact operation of businesses should include the proper notification.

In conclusion, the project has overwhelming support from all entities and interest groups, but the challenge will be in developing a clear, consistent message, having an effective planning process that incorporates a variety of interests and recording and incorporating the public's comments as appropriate.

Appendices

Appendix A: Community Interviews

The following list of community representatives participated in community interviews with the Water District over February and March of 2000. Names of the primary contacts are listed first, followed by names of additional contacts on relevant subject matter. These names have come out of conversations with the initial interviews.

Organization	Contacts
Alviso Representatives	
Mujere Latina	Group members
Fire Department Chief	Richard Santos
Our Lady, Star of the Sea Catholic Church	Father Steven Brown
Librarian	Maria Blankenship, Dean Baird
South Bay Yacht Club	Russ Robinson
~~Alviso Local Businesses~~	~~Maria Elena & Vahl's~~ No response
~~Alviso Community Action Committee~~	~~Rubin and Val Orozco~~ No response
Alviso Master Planning Committee	David Hoxie
Cargill Salts	Bob Douglas
Rotary Club Organizer	Mel Guerrera
San Jose and Santa Clara Resident Representatives	
Mansion Grove Apartments	Tracy Brunetti
Syntex Development Company	Scott Hilk
Bazzare Corp.	Frank Bazzare
Northside Residents Homeowners Association	Lorne Smyth
Business Representatives	
Hispanic Chamber of Commerce	Marin Arreola
Hewlett Packard, Agilent Technologies	Jonathan Bower, Gail Brownell
Silicon Valley Manufacturing Group	Chris Elias
League Of Women Voters	Virginia Holtz (Sue Swackhamer was not available)
~~Hyundai Electronics~~	No response
San Jose Silicon Valley Chamber of Commerce	Jim Tucker
Environmental Representatives	
Santa Clara County Parks and Recreation	Debbie Zapien, Mark Fredrick
CLEAN South Bay	Trish Mulvey
Silicon Valley Pollution Prevention Center	Pat Ferraro
Santa Clara Valley Streams for Tomorrow	Keith Anderson
Santa Clara Valley Audubon Society	Craig Breon

Each interview was adapted to the respondent's unique perspective and interests. However, the primary four subject areas were covered with each interview. Those subjects were:

- Familiarity with the Santa Clara Water District
- Experience with flooding
- Benefits and Issues with the Lower Guadalupe Flood Protection Project
- How best to outreach to the public that the interviewee represents

These subjects were chosen to gain insights about the interviewee's position on the performance of the water district and the positive aspects of this project. The subject of flood experience is intended to provide each individual with a sense of expertise on the subject of flood protection. This experience recall helps people think about the context of the project, and provides a natural lead in about what the benefits and issues of this project are for the individual. Finally, understanding how people get information is vital to a successful outreach program. More than ever, people differ on how they absorb current events and information about their community, whether some prefer newspaper, direct mail, e-mail or other mediums.

Interviews were collected with a commitment of confidentiality. The information has helped to refine the Public Outreach Plan for the Lower Guadalupe River and the project alternatives under consideration for the Lower Guadalupe River Flood Protection Project.

Appendix B: Public Involvement Schedule

153735.04.02 ScheduleFINAL.fh8 5/9/01(EG)

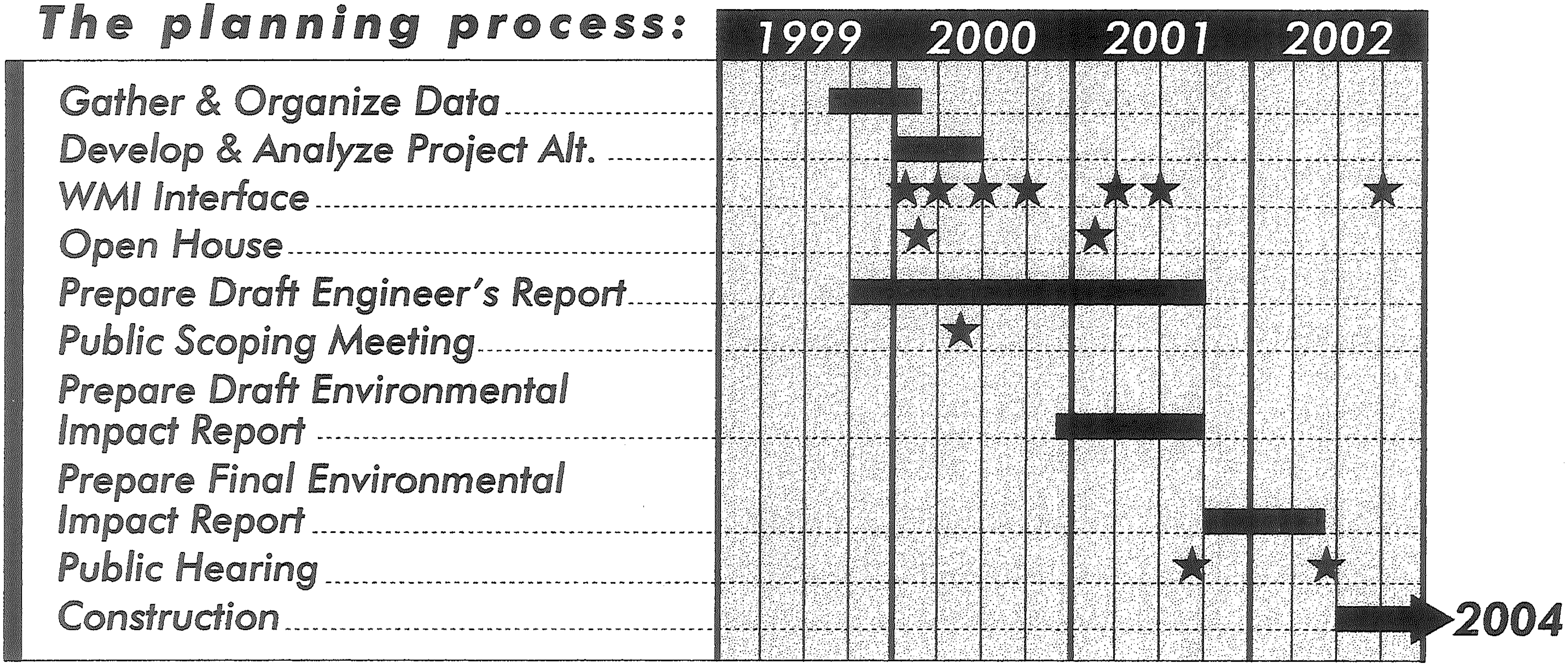


Figure B-1
Public Involvement Schedule
Lower Guadalupe River Project

CH2MHILL

Appendix C: Public Involvement Documents

A final Appendix C will be provided to the District at the completion of the project. This Appendix will include final presentation meeting notes, articles written/provided to public newsletters/e-mail lists, final presentations, and other items created for the project as appropriate.

Appendix D

Appendix D
Maintenance Guidelines

Table D-1
Maintenance Standards for Sediment and Vegetation Removal, Lower Guadalupe River, I-880 to 120 m Downstream
Reach A

	Facility Type	Maintenance Issue	Acceptable Maintenance Limit	Performance Criteria
Existing Natural Channel	Channel overbanks	Vegetation	Recut all vegetation when approximately 80 percent of the vegetation exceeds 1 meter (3 ft) high. Preserve root mass.	Cut vegetation (brush, vines, etc.) to < 0.3 m (1 ft) Remove standing crop as necessary
	Inboard levee slopes	Vegetation	As often as necessary.	Removal and control of non-native species, woody vegetation and combustible weeds and grasses with post-emergent herbicides. Dead or fallen trees and trash would be removed.
	Maintenance Roads	Vegetation obstructing roadway	No vegetation on roads	Spray with post-emergent herbicides.
	Maintenance Ramps	Vegetation overhanging roadway	No vegetation to overhang on roadway	Cut back overhanging vegetation to edge of maintenance road up to the height of 6.7 m (21 ft).
NOTE: In bridge transition areas, woody vegetation would be thinned so that a low density of woody vegetation occurs in critical areas. A specific performance criteria to meet would be that woody vegetation (willows, cottonwoods, etc.) would not exceed greater than approximately 2 percent of overall cover in bridge transitions. This percent cover translates to remaining trees located on approximately 9.1 m (30-ft) centers.				

Table D-2
Maintenance Standards for Sediment and Vegetation Removal, Lower Guadalupe River
Reach A, Outside of Existing Mitigation Sites

	Facility Type	Maintenance Issue	Acceptable Maintenance Limit	Performance Criteria
Existing Natural Channel	Overbanks	Vegetation	Recut flexible vegetation (brush, vines, etc.) when height exceeds 1 m (3 ft) Recut woody vegetation (willows, cottonwoods, etc.) when height > 1.5 m (5 ft).	Cut flexible vegetation (brush, vines, etc.) to < 0.3 m (1 ft). Cut overhanging branches from established woody vegetation (willows, cottonwoods, etc.) when overhangs are equal or < 6.1 m (20 ft) above the channel and greater than 0.152 m in diameter.
	Inboard levee slope	Vegetation	As often as necessary.	Removal and control of non-native species, woody vegetation and combustible weeds and grasses with post-emergent herbicides. Dead or fallen trees and trash would be removed.
	Maintenance Roads	Vegetation obstructing roadway	No vegetation on roads	Spray with post-emergent herbicides.
	Maintenance Ramps	Vegetation overhanging roadway	No vegetation to overhang on roadway	Cut back overhanging vegetation to edge of maintenance road up to the height of 6.7 m (21 ft).

NOTE: In bridge transition areas, woody vegetation would be thinned so that a low density of woody vegetation occurs in critical areas. A specific performance criteria to meet would be that woody vegetation (willows, cottonwoods, etc.) would not exceed greater than approximately 2 percent of overall cover in bridge transitions. This percent cover translates to remaining trees located on approximately 9.1 m (30-ft) centers.

Table D-3
Maintenance Standards for Sediment and Vegetation Removal, Lower Guadalupe River, Station 17+000 to 17+520
Reach A, Restricted

	Facility Type	Maintenance Issue	Acceptable Maintenance Limit	Performance Criteria
Existing Natural Channel	Overbanks	Vegetation	Cut all vegetation excluding SRA and Caltrans mitigation areas.	Cut vegetation (outside mitigation areas) to < 0.3 m (1 ft).
	Inboard levee slopes	Vegetation	As often as necessary.	Removal and control of non-native species, woody vegetation and combustible weeds and grasses with post-emergent herbicides. Dead or fallen trees and trash would be removed.
	USACE Riverine Aquatic (SRA) Mitigation Area and Caltrans Mitigation Bench	Vegetation	Prune vegetation to encourage development of a single trunk. Clear snags and debris only if obstructing flow in Caltrans mitigation bench.	Prune 4.5-m (14.8 ft)-wide SRA on either side of the low flow channel
	Maintenance Roads	Vegetation obstructing roadway	No vegetation on roads	Spray with post-emergent herbicides.
	Maintenance Ramps	Vegetation overhanging roadway	No vegetation to overhang roadway	Cut back overhanging vegetation to edge of maintenance road up to the height of 6.7 m (21 ft).

NOTE: In bridge transition areas, woody vegetation would be thinned so that a low density of woody vegetation occurs in critical areas. A specific performance criteria to meet would be that woody vegetation (willows, cottonwoods, etc.) would not exceed greater than approximately 2 percent of overall cover in bridge transitions. This percent cover translates to remaining trees located on approximately 9.1 m (30-ft) centers.

Table D-4

Maintenance Standards for Sediment and Vegetation Removal, Lower Guadalupe River, Station 14+730 to 16+500 and 16+500 to 17+000

Reach A, District and Unrestricted

	Facility Type	Maintenance Issue	Acceptable Maintenance Limit	Performance Criteria
Existing Natural Channel	Overbanks	Vegetation	Cut all vegetation excluding SRA and Caltrans mitigation bench.	Cut vegetation to < 0.3 m (1 ft).
	Inboard levee slopes	Vegetation	As often as necessary.	Removal and control of non-native species, woody vegetation and combustible weeds and grasses with post-emergent herbicides. Dead or fallen trees and trash would be removed.
	Maintenance Roads	Vegetation obstructing roadway	No vegetation on roads	Spray with post-emergent herbicides.
	Maintenance Ramps	Vegetation overhanging roadway	No vegetation to overhang roadway	Cut back overhanging vegetation to edge of maintenance road up to the height of 6.7 m (21 ft).
	Caltrans Mitigation Bench	Vegetation	As necessary to prevent obstruction of flow.	Clear snags and debris.
	USACE Shaded Riverine Aquatic (SRA) Mitigation Area and District SRA	Vegetation	As necessary to prevent obstruction of flow.	Clear snags and debris.
NOTE: In bridge transition areas, woody vegetation would be thinned so that a low density of woody vegetation occurs in critical areas. A specific performance criteria to meet would be that woody vegetation (willows, cottonwoods, etc.) would not exceed greater than approximately 2 percent of overall cover in bridge transitions. This percent cover translates to remaining trees located on approximately 9.1 m (30-ft) centers.				

Table D-5
Maintenance Standards for Sediment and Vegetation Removal, Lower Guadalupe River, Trimble Road to Highway 101
Reach B

	Facility Type	Maintenance Issue	Acceptable Maintenance Limit	Performance Criteria
Existing Natural Channel	Channel, overbank	Vegetation	Recut flexible vegetation (brush, vines, etc.) when height exceeds 1 m (3 ft). Recut when height > 1.5 m (5 ft).	Cut flexible vegetation (brush, vines, etc.) to < 0.3 m (1 ft). Cut overhanging branches from established woody vegetation (willows, cottonwoods, etc.) that are equal or < 6 m (20 ft) above the channel and greater than 0.152 m (6 in) in diameter.
	Inboard levee slopes	Vegetation	As often as necessary.	Removal and control of non-native species, woody vegetation and combustible weeds and grasses with post-emergent herbicides. Dead or fallen trees and trash would be removed.
	Riparian buffer area and low flow channel	Vegetation	As necessary to prevent obstruction of flow.	Clear snags and debris.
	Maintenance Roads	Vegetation obstructing roadway	No vegetation on roads	Spray with post-emergent herbicides.
	Maintenance Ramps	Vegetation overhanging roadway	No vegetation to overhang roadway	Cut back overhanging vegetation to edge of maintenance road up to the height of 6.7 m (21 ft).
	Channel Overbank	Sediment	Re-excavate when sediment accumulates to a distance of 3.9 m (12.8 ft) below the levee crest.	Excavate overbanks to a depth of 4.5 m (14.8 ft) below the crest of the levee from outside edge of 6 m buffer on both sides of the low flow channel to levee toe.

NOTE: In bridge transition areas, woody vegetation would be thinned so that a low density of woody vegetation occurs in critical areas. A specific performance criteria to meet would be that woody vegetation (willows, cottonwoods, etc.) would not exceed greater than approximately 2 percent of overall cover in bridge transitions. This percent cover translates to remaining trees located on approximately 9.1 m (30-ft) centers.

Table D-6

Maintenance Standards for Sediment and Vegetation Removal, Lower Guadalupe River, Montague Expressway to Trimble Road

Reach C

	Facility Type	Maintenance Issue	Acceptable Maintenance Limit	Performance Criteria
Existing Natural Channel	30.5-m-wide excavated overflow channel and overbanks	Vegetation	Recut flexible vegetation (brush, vines, etc.) when approximately 80 percent of the vegetation exceeds 1 meter (3 ft) high or based on District staff judgement. Recut woody vegetation (willows, cottonwoods, etc.) when height > 1.5 m (5ft) spacing is less than 1.5 m (5 ft), and when it exceeds approximately 5% of overall cover.	Cut flexible vegetation (brush, vines, etc.) to < 0.3 m (1 ft). Cut established woody vegetation (willows, cottonwoods, etc.) in overflow channel to less than 0.3 m (1 ft).
	Inboard Levee slope	Vegetation	As often as necessary.	Removal and control of non-native species, woody vegetation and combustible weeds and grasses with post-emergent herbicides. Dead or fallen trees and trash would be removed.
	Riparian corridor and Existing Mitigation	Vegetation	As necessary to prevent obstruction of flow.	Clear snags and debris.
	Depressed maintenance road	Vegetation obstructing roadway	No vegetation on roads	Spray pre-emergent and post emergent weeds.
	Maintenance Roads	Vegetation obstructing roadway	No vegetation on roads	Spray with post-emergent herbicides.
	Maintenance Ramps	Vegetation overhanging roadway	No vegetation to overhang roadway	Cut back overhanging vegetation to edge of maintenance road up to the height of 6.7 m (21 ft).
	30.5-m-wide excavated overflow channel	Sediment	Re-excavate when sediment depth > 0.6 m (2 ft).	Excavate channel to 1 m (3 ft) below maintenance road from edge of depressed maintenance road toward low flow channel.

NOTE: In bridge transition areas, woody vegetation would be thinned so that a low density of woody vegetation occurs in critical areas. A specific performance criteria to meet would be that woody vegetation (willows, cottonwoods, etc.) would not exceed greater than approximately 2 percent of overall cover in bridge transitions. This percent cover translates to remaining trees located on approximately 9.1 m (30-ft) centers.

Table D-7
Maintenance Standards for Sediment and Vegetation Removal, Lower Guadalupe River, Hetch-Hetchy Pipeline to Montague Expressway
Reach D

	Facility Type	Maintenance Issue	Acceptable Maintenance Limit	Performance Criteria
Existing Natural Channel	10.6-m wide excavated overflow channel and overbanks	Vegetation	Recut flexible vegetation (brush, vines, etc.) when height > 1 m (3 ft).	Cut flexible vegetation (brush, vines, etc.) to < 0.3 m (1 ft).
			Recut flexible vegetation (brush, vines, etc.) when approximately 80 percent of the vegetation exceeds 0.9 meters (3 feet) high or based on District staff judgement.	Cut woody vegetation (willows, cottonwoods, etc.) to < 0.3m (1 ft).
			Recut woody vegetation (willows, cottonwoods, etc.) when vegetation height is approximately 1.5 m (5 ft) and when woody vegetation (willows, cottonwoods, etc.) exceeds approximately 5 percent overall cover.	Cut established woody vegetation (willows, cottonwoods, etc.) in overflow channel.
	Inboard Levee Slope	Vegetation	As often as necessary.	Removal and control of non-native species, woody vegetation and combustible weeds and grasses with post-emergent herbicides. Dead or fallen trees and trash would be removed.
	30- to 45-m buffer	Vegetation	As necessary to prevent obstructing of flow.	Clear snag and debris.
	Depressed maintenance road	Vegetation obstructing roadway	No vegetation on roads	Spray with post-emergent herbicides.
	Maintenance Roads	Vegetation obstructing roadway	No vegetation on roads	Spray with post-emergent herbicides.
	Maintenance Ramps	Vegetation overhanging roadway	No vegetation to overhang roadway	Cut back overhanging vegetation to edge of maintenance road up to the height of 6.7 m (21 ft).
	10.6-m-wide excavated overflow channel	Sediment	Re-excavate when sediment depth > 0.6 m.	Excavate channel to 2 m below maintenance road from edge of depressed maintenance road toward low flow channel.

NOTE: In bridge transition areas, woody vegetation (willows, cottonwoods, etc.) would be thinned so that a low density of woody vegetation occurs in critical areas. A specific performance criteria to meet would be that woody vegetation (willows, cottonwoods, etc.) would not exceed greater than approximately 2 percent of overall cover in bridge transitions. This percent cover translates to remaining trees located on approximately 9.1 m (30-ft) centers.

Table D-8

Maintenance Standards for Sediment and Vegetation Removal, Lower Guadalupe River, Tasman Drive to Hetch-Hetchy Pipeline

Reach E

	Facility Type	Maintenance Issue	Acceptable Maintenance Limit	Performance Criteria
Existing Natural Channel	10.6-m-wide excavated overflow channel	Vegetation	Recut flexible vegetation (brush, vines, etc.) when approximately 80% of the height > 1 m (3 ft). Recut woody vegetation (willows, cottonwoods, etc.) when height is approximately 1.5 m (5 ft) and when woody vegetation (willows, cottonwoods, etc.) exceeds approximately 5 percent overall cover.	Cut flexible vegetation (brush, vines, etc.) to < 0.3 m (1 ft). Cut established woody vegetation (willows, cottonwoods, etc.) in overflow channel.
	Channel overbanks	Vegetation	Recut when height of vegetation is < 0.6 m (2 ft). Recut when height and spacing of vegetation is < 1.5 m (5 ft).	Cut flexible vegetation to < 0.3 m (1 ft). Cut established vegetation to < 0.6 m (2 ft).
	Inboard levee slope	Vegetation	As often as necessary.	Removal and control of non-native species, woody vegetation and combustible weeds and grasses with post-emergent herbicides. Dead or fallen trees and trash would be removed.
	30- to 45-m buffer	Vegetation	As necessary to prevent obstruction of flow.	Clear snags and debris.
	Depressed maintenance road	Vegetation obstructing roadway	No vegetation on roads	Spray with post-emergent herbicides.
	Maintenance Roads	Vegetation obstructing roadway	No vegetation on roads	Spray with post-emergent herbicides.
	Maintenance Ramps	Vegetation overhanging roadway	No vegetation to overhang roadway	Cut back overhanging vegetation to edge of maintenance road up to the height of 6.7 m (21 ft).
	10.6-m-wide excavated overflow channel	Sediment	Re-excavate when sediment depth > 0.6 m (2 ft).	Excavate channel to 2 m below maintenance road from edge of depressed maintenance road toward low flow channel.

NOTE: In bridge transition areas, woody vegetation (willows, cottonwoods, etc.) would be thinned so that a low density of woody vegetation (willows, cottonwoods, etc.) occurs in critical areas. A specific performance criteria to meet would be that woody vegetation (willows, cottonwoods, etc.) would not exceed greater than approximately 2 percent of overall cover in bridge transitions. This percent cover translates to remaining trees located on approximately 9.1 m (30-ft) centers.

Table D-9

Maintenance Standards for Sediment and Vegetation Removal, Lower Guadalupe River, Route 237 to Tasman Drive

Reach F

	Facility Type	Maintenance Issue	Acceptable Maintenance Limit	Performance Criteria
Existing Natural Channel	Overbanks	Vegetation	Remove or reduce standing crop when height is > 0.6 m (2 ft). Exclude a 6 m (18 ft) buffer on either side of the low flow channel	Cut flexible vegetation (brush, vines, etc.) to < 0.3 m (1 ft).
	Inboard levee slopes	Vegetation	As often as necessary.	Removal and control of non-native species, woody vegetation and combustible weeds and grasses with post-emergent herbicides. Dead or fallen trees and trash would be removed.
	Riparian buffer area and low flow channel	Vegetation	As necessary to prevent obstruction of flow.	Clear snags and debris only.
	Maintenance Roads	Vegetation obstructing roadway	No vegetation on roads	Spray with post-emergent herbicides.
	Maintenance Ramps	Vegetation overhanging roadway	No vegetation to overhang roadway	Cut back overhanging vegetation to edge of maintenance road up to the height of 6.7 m (21 ft).

NOTE: In bridge transition areas, woody vegetation (willows, cottonwoods, etc.) would be thinned so that a low density of woody vegetation occurs in critical areas. A specific performance criteria to meet would be that woody vegetation (willows, cottonwoods, etc.) would not exceed greater than approximately 2 percent of overall cover in bridge transitions. This percent cover translates to remaining trees located on approximately 9.1 m (30-ft) centers.

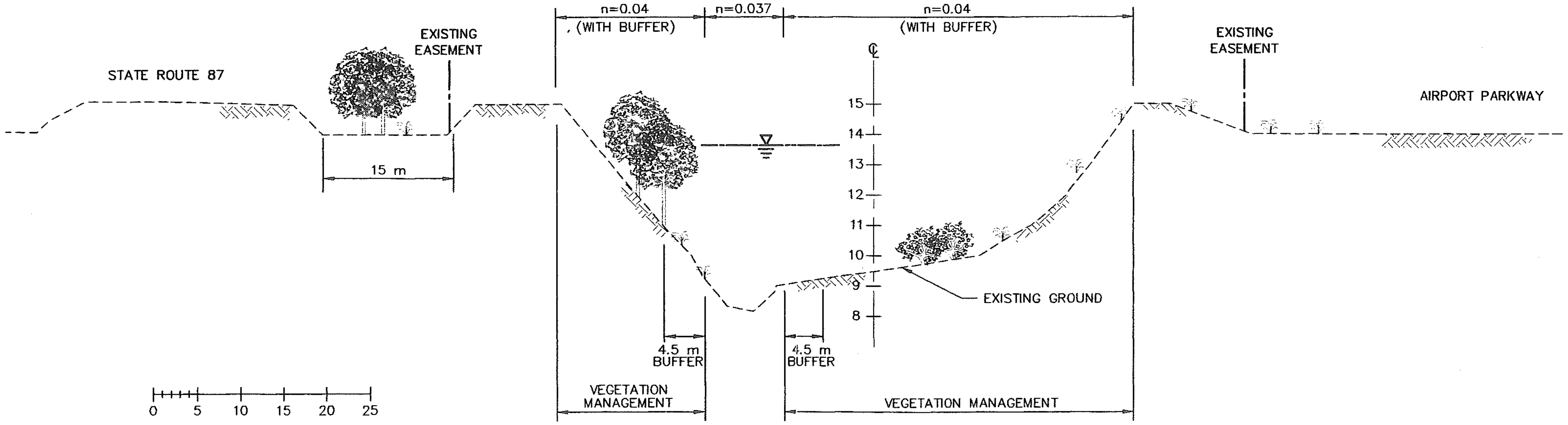
Table D-10
Maintenance Standards for Sediment and Vegetation Removal, Lower Guadalupe River, UPRR to Route 237
Reach G

	Facility Type	Maintenance Issue	Acceptable Maintenance Limit	Performance Criteria
Existing Natural Channel	Channel, overbank	Vegetation	Recut when approximately 80 percent of the vegetation exceeds 1 meter (3 ft) high. Recut when vegetation height is approximately 1.5 m (5 ft) and when woody vegetation exceeds approximately 5 percent overall cover. Exclude a 6-m (18 ft) buffer on either side of the low flow channel.	Cut flexible vegetation (brush, vines, etc.) to < 0.3 m (1 ft). Cut woody vegetation (willows, cottonwoods, etc.) to < 0.3 m (1 ft).
	Inboard levee slopes	Vegetation	As often as necessary.	Removal and control of non-native species, woody vegetation and combustible weeds and grasses with post-emergent herbicides. Dead or fallen trees and trash would be removed.
	Riparian buffer area and low flow channel	Vegetation	As necessary to prevent obstruction of flow.	Clear snags and debris.
	Maintenance Roads	Vegetation obstructing roadway	No vegetation on roads	Spray with post-emergent herbicides.
	Maintenance Ramps	Vegetation overhanging roadway	No vegetation to overhang roadway	Cut back overhanging vegetation to edge of maintenance road up to the height of 6.7 m (21 ft)
	Overbank areas	Sediment	Re-excavate when sediment accumulates to > 0.6 m.	Excavate a 12-m (36 ft) section adjacent to the toe of the depressed maintenance road to a depth of 1 m (3 ft) from outside edge of 6-m (18 ft) buffer on both sides of the low flow channel to levee toe.

NOTE: In bridge transition areas, woody vegetation would be thinned so that a low density of woody vegetation occurs in critical areas. A specific performance criteria to meet would be that woody vegetation (willows, cottonwoods, etc.) would not exceed greater than approximately 2 percent of overall cover in bridge transitions. This percent cover translates to remaining trees located on approximately 9.1 m (30-ft) centers.

Metric

[NOT FOR CONSTRUCTION]



STA 14+585 TO STA 15+550

OUTSIDE CALTRANS & USACE MITIGATION SITES

REACH A

NTS

▽ DESIGN WATER SURFACE

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

1. SECTION CUT LOOKING UPSTREAM

2. BRIDGE TRANSITION AREAS FOR ALL REACHES REQUIRE SPECIAL VEGETATION MANAGEMENT TREATMENT 30 m (100 ft) UPSTREAM TO 30 m (100 ft) DOWNSTREAM FROM BRIDGE FACES

CH2MHILL
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(408)436-4909

DATE 06/19/01
DESIGN JAM
DRAWN JAM
CHECKED EG

Santa Clara Valley Water District

ACCEPTED BY DISTRICT

PROJECT ENGINEER
DATE

LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT

STA 14+585 TO STA 15+550
TYPICAL SECTIONS

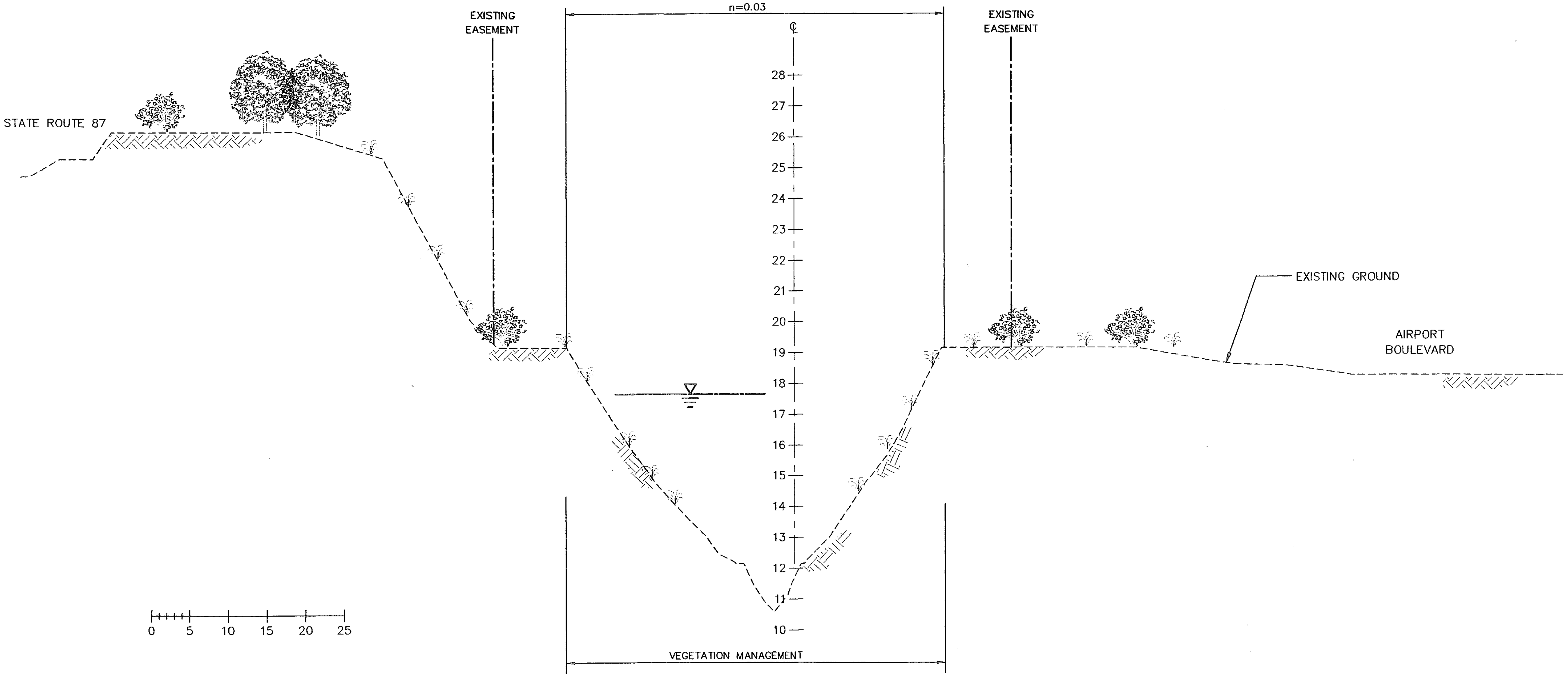
VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE
N.T.S.

FIGURE
D-1

PROJECT: 153735
DWG NAME: Acad\Rpt\OM_XS\D1.dwg
X-REF(S): Acad\Xrefs\SC-bdr3.dwg

Metric



(A/–) STA 17+492 TO STA 17+582 (17+550)
VEGETATION MANAGEMENT 120 METERS DOWNSTREAM OF I–880
REACH A
NTS

[NOT FOR CONSTRUCTION]

▽ DESIGN WATER SURFACE

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

1. SECTION CUT LOOKING UPSTREAM

2. BRIDGE TRANSITION AREAS FOR ALL REACHES REQUIRE SPECIAL VEGETATION MANAGEMENT TREATMENT 30 m (100 ft) UPSTREAM TO 30 m (100 ft) DOWNSTREAM FROM BRIDGE FACES

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DRAWN JAM
CHECKED EG

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
DATE
PROJECT ENGINEER

LOWER GUADALUPE RIVER
FLOOD PROTECTION PROJECT
STA 17+492 TO 17+582
TYPICAL SECTIONS

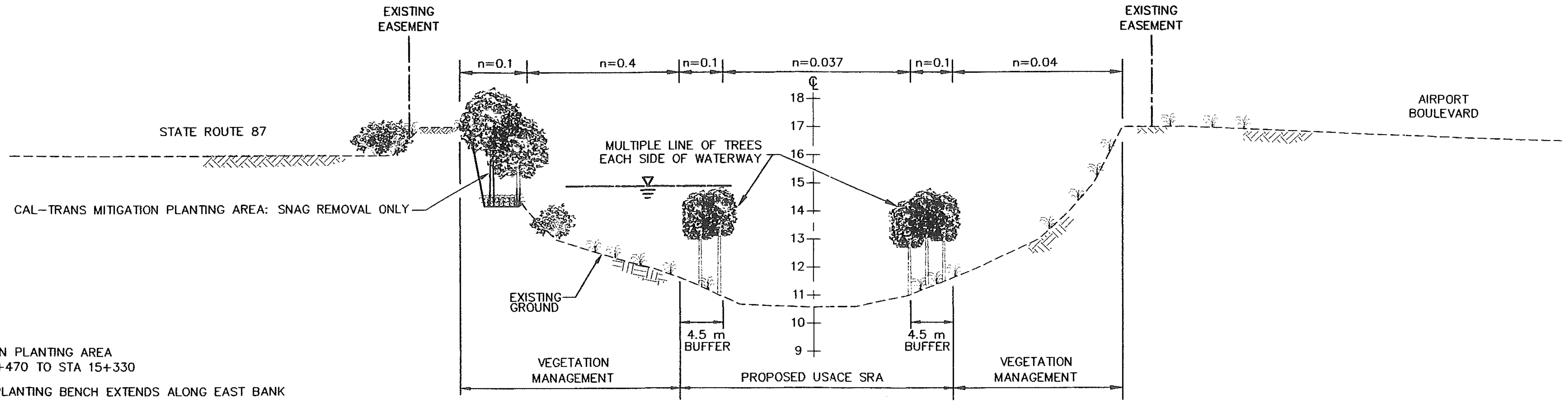
VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE N.T.S.

FIGURE D–2

PROJECT: 153735
DWG NAME: Acad\Rpt\OM_XS\D2.dwg
X–REF(S): Acad\Xrefs\SC–bdr3.dwg

Metric

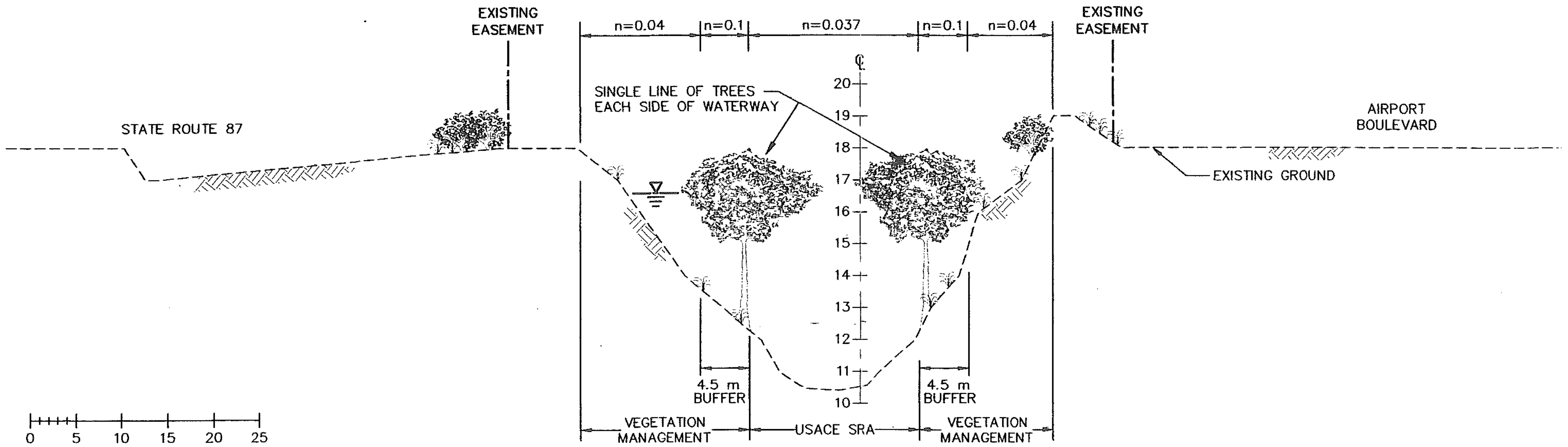


DISTRICT SRA MITIGATION PLANTING AREA
EXTENDS FROM STA 14+470 TO STA 15+330

CALTRANS MITIGATION PLANTING BENCH EXTENDS ALONG EAST BANK
FROM STA 17+430 TO STA 16+680 AND STA 15+550 TO STA 15+630

VEGETATION MANAGEMENT: FLEXIBLE VEGETATION CUT TO 0.3 m HEIGHT AND RE-CUT WHEN HEIGHT IS GREATER THAN 0.9 m. WOODY VEGETATION REMOVED TO LESS THAN OR EQUAL TO 0.3 m AND RE-CUT WHEN HEIGHT IS GREATER OR EQUAL TO 1.5 m.

A / – **STA 16+500 TO STA 17+000**
UNRESTRICTED SRA HABITAT
PROPOSED DISTRICT SRA
REACH A
NTS



B / – **STA 17+00 TO STA 17+520**
RESTRICTED SRA HABITAT
REACH A
NTS

∇ DESIGN WATER SURFACE

[NOT FOR CONSTRUCTION]

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES
1. SECTION CUT LOOKING UPSTREAM.
2. USACE SHADED RIVERINE AQUATIC (SRA)

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DATE 06/19/01
DESIGN JAM
DRAWN JAM
CHECKED EG

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
DATE
PROJECT ENGINEER

LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT
STA 16+500 TO STA 17+000
STA 17+000 TO STA 17+520
TYPICAL SECTIONS

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

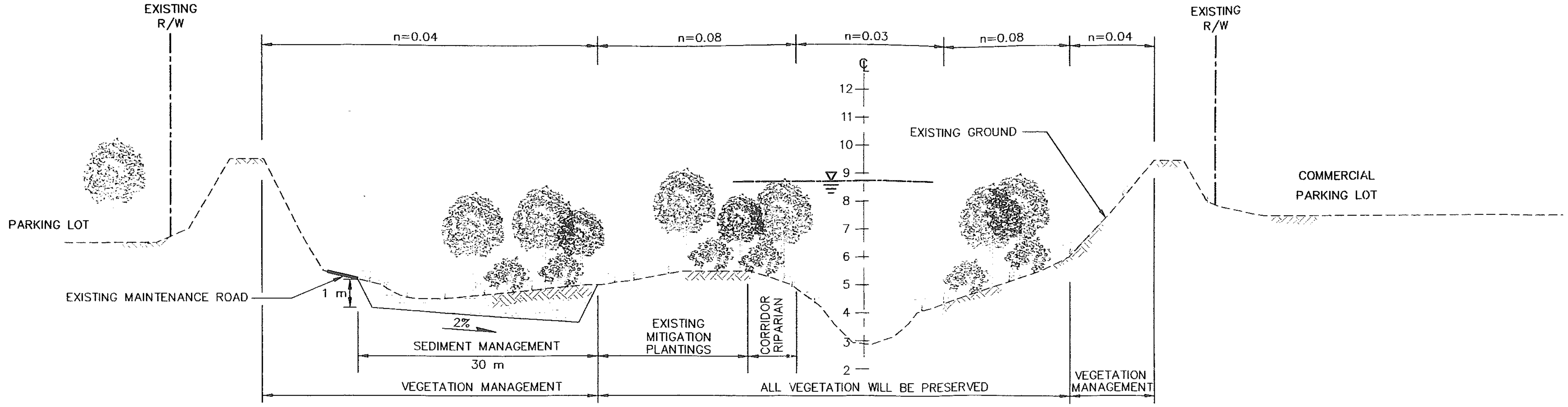
SCALE N.T.S.

FIGURE D-3

PROJECT: [illegible]3735
DWG NAME: Acad\Rpt\OM_XS\D3.dwg
X-REF(S): Acad\Xrefs\SC-bdr3.dwg

Metric

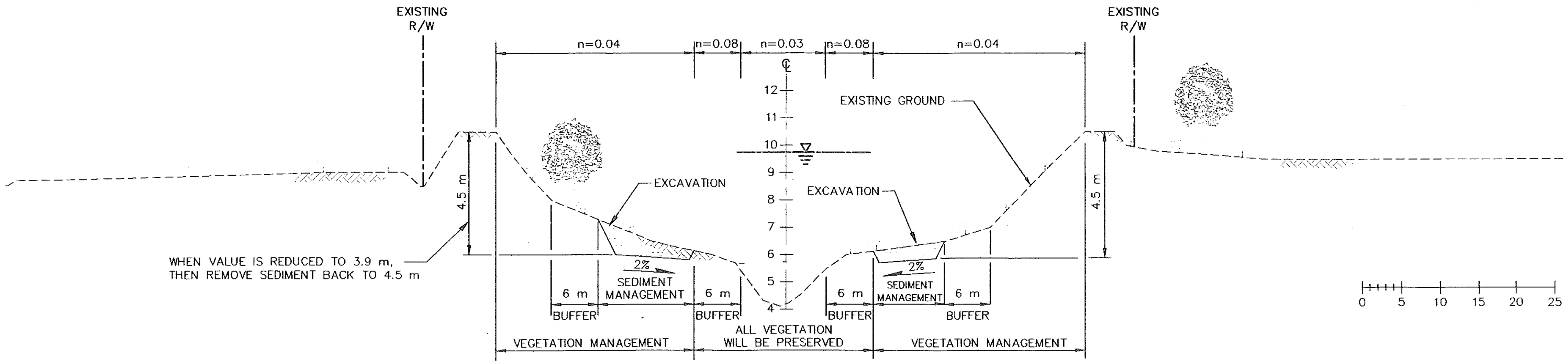
[NOT FOR CONSTRUCTION]



VEGETATION MANAGEMENT: FLEXIBLE VEGETATION CUT TO 0.3 m HEIGHT AND RE-CUT WHEN HEIGHT IS GREATER OR EQUAL TO 1 m. WOODY VEGETATION REMOVED TO LESS THAN OR EQUAL TO 0.3 m AND RE-CUT WHEN HEIGHT IS GREATER OR EQUAL TO 1.5 m.

SEDIMENT MANAGEMENT: DREDGE TO 1 m BELOW ELEVATION OF DEPRESSED MAINTENANCE ROAD, THEN RE-EXCAVATE WHEN SEDIMENT DEPTH IS GREATER THAN 0.6 m.

A/– STA 11+870 TO STA 13+645
MONTAGUE EXPRESSWAY TO TRIMBLE ROAD
REACH C
NTS



VEGETATION MANAGEMENT: FLEXIBLE VEGETATION CUT TO 0.3 m HEIGHT AND RE-CUT WHEN HEIGHT IS GREATER THAN 0.9 m. WOODY VEGETATION REMOVED TO LESS THAN OR EQUAL TO 0.3 m AND RE-CUT WHEN HEIGHT IS GREATER OR EQUAL TO 1.5 m.

SEDIMENT MANAGEMENT: EXCAVATED MATERIAL TO BE REMOVED FROM PROJECT.

B/– STA 13+755 TO STA 14+472
TRIMBLE ROAD TO HIGHWAY 101
REACH B
NTS

▽ DESIGN WATER SURFACE

PROJECT: 153735
DWG NAME: Acad\Rprt\OM_XS\D4.dwg
X-REF(S): Acad\Xrefs\SC-bdr3.dwg

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES
1. SECTION CUT LOOKING UPSTREAM

2. BRIDGE TRANSITION AREAS FOR ALL REACHES REQUIRE SPECIAL VEGETATION MANAGEMENT TREATMENT 30 m (100 ft) UPSTREAM TO 30 m (100 ft) DOWNSTREAM FROM BRIDGE FACES

3. SEDIMENT MANAGEMENT: EXCAVATED MATERIAL TO BE REMOVED FROM PROJECT

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PROJECT ENGINEER
DATE

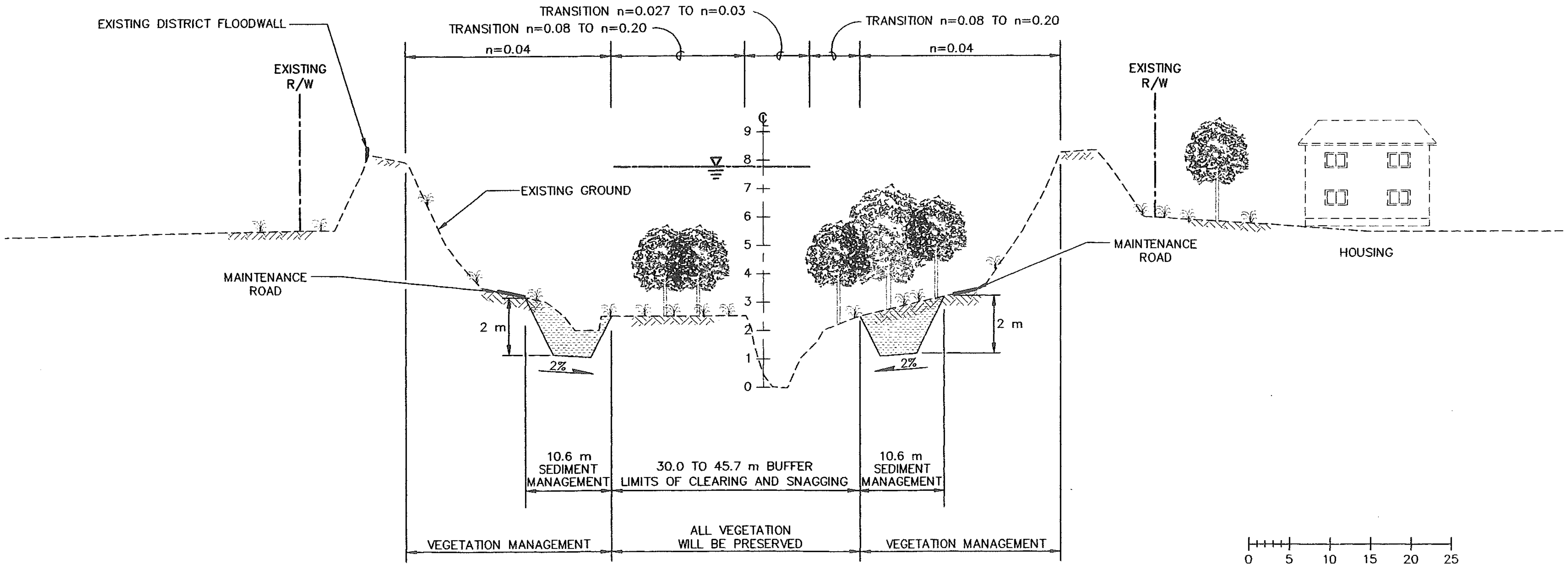
LOWER GUADALUPE RIVER
FLOOD PROTECTION PROJECT
STA 11+870 TO STA 13+645
STA 13+755 TO STA 14+472
TYPICAL SECTIONS

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE N.T.S.

FIGURE D-4

[NOT FOR CONSTRUCTION]



EXISTING DISTRICT FLOODWALL
TRANSITION n=0.027 TO n=0.03
TRANSITION n=0.08 TO n=0.20
TRANSITION n=0.08 TO n=0.20
n=0.04
n=0.04
EXISTING R/W
EXISTING R/W
℄
9
8
7
6
5
4
3
2
1
0
EXISTING GROUND
MAINTENANCE ROAD
MAINTENANCE ROAD
HOUSING
2 m
2 m
2%
2%
10.6 m SEDIMENT MANAGEMENT
30.0 TO 45.7 m BUFFER LIMITS OF CLEARING AND SNAGGING
10.6 m SEDIMENT MANAGEMENT
VEGETATION MANAGEMENT
ALL VEGETATION WILL BE PRESERVED
VEGETATION MANAGEMENT
0
5
10
15
20
25

A / 6-5 **STA 10+127 TO STA 11+773**
HETCH-HETCHY PIPELINE TO MONTAGUE EXPRESSWAY
REACH D
NTS

VEGETATION MANAGEMENT:	CUT VEGETATION TO 0.3 m HEIGHT RE-CUT WHEN HEIGHT IS GREATER OR EQUAL TO 1 m
SEDIMENT MANAGEMENT:	DREDGING – EXCAVATE TO 2 m BELOW MAINTENANCE ROAD
MAINTENANCE ROADS:	CUT VEGETATION TO 0.3 m HEIGHT RE-CUT WHEN HEIGHT IS GREATER OR EQUAL TO 1 m

▽ DESIGN WATER SURFACE

PROJECT: 153735
DWG NAME: Acad\Rprt\OM_XS\D5.dwg
X-REF(S): Acad\Xrefs\SC-bdr3.dwg

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES
1. SECTION CUT LOOKING UPSTREAM
2. BRIDGE TRANSITION AREAS FOR ALL REACHES REQUIRE SPECIAL VEGETATION MANAGEMENT TREATMENT 30 m (100 ft) UPSTREAM TO 30 m (100 ft) DOWNSTREAM FROM BRIDGE FACES
3. SEDIMENT MANAGEMENT: EXCAVATED MATERIAL TO BE REMOVED FROM PROJECT

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DATE
PROJECT ENGINEER

LOWER GUADALUPE RIVER
FLOOD PROTECTION PROJECT
STA 10+127 TO STA 11+773
TYPICAL SECTION

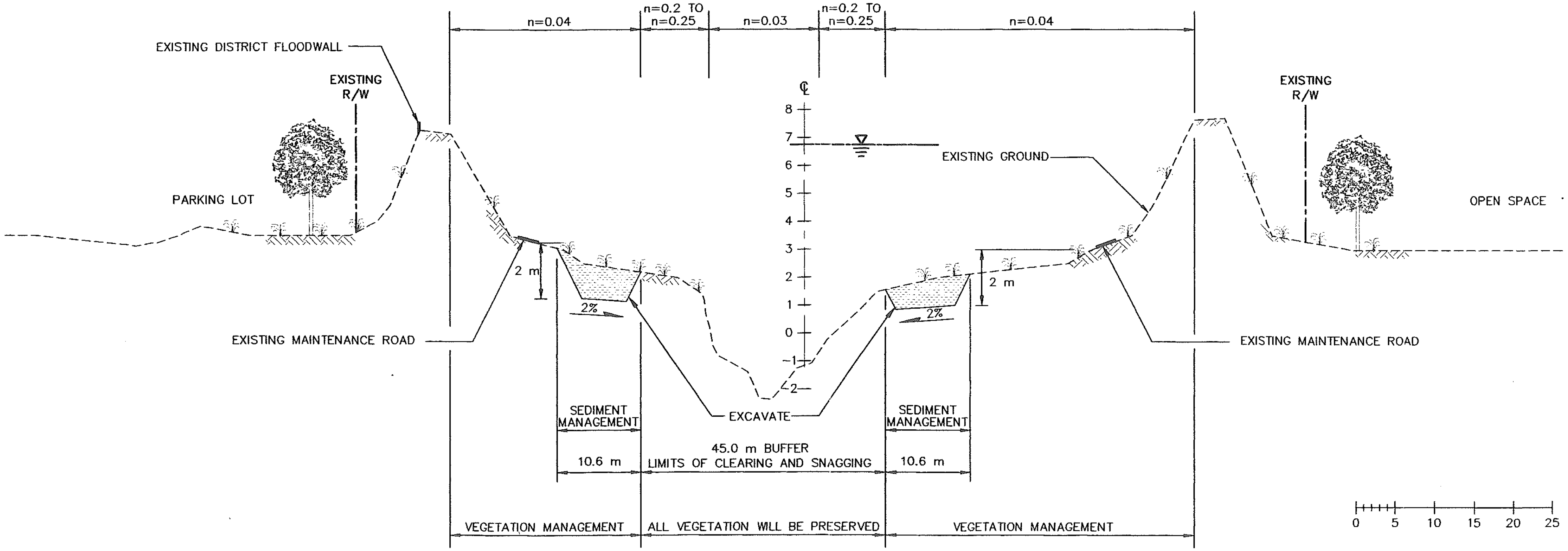
VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE N.T.S.

FIGURE D-5

Metric

[NOT FOR CONSTRUCTION]



A/– STA 9+290 TO STA 10+127
TASMAN DRIVE TO HETCH–HETCHY PIPELINE
REACH E
NTS

VEGETATION MANAGEMENT: CUT VEGETATION TO 0.3 m HEIGHT
RE–CUT WHEN HEIGHT IS
GREATER OR EQUAL TO 1 m

SEDIMENT MANAGEMENT: DREDGING – EXCAVATE TO 2 m
BELOW MAINTENANCE ROAD

DESIGN WATER SURFACE

PROJECT: 153735
DWG NAME:Acad\Rprt\OM_XS\D6.dwg
X–REF(S):Acad\Xrefs\SC-bdr3.dwg

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES
1. SECTION CUT LOOKING UPSTREAM

2. BRIDGE TRANSITION AREAS FOR ALL REACHES REQUIRE SPECIAL VEGETATION MANAGEMENT TREATMENT 30 m (100 ft) UPSTREAM TO 30 m (100 ft) DOWNSTREAM FROM BRIDGE FACES

3. SEDIMENT MANAGEMENT: EXCAVATED MATERIAL TO BE REMOVED FROM PROJECT

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PROJECT ENGINEER
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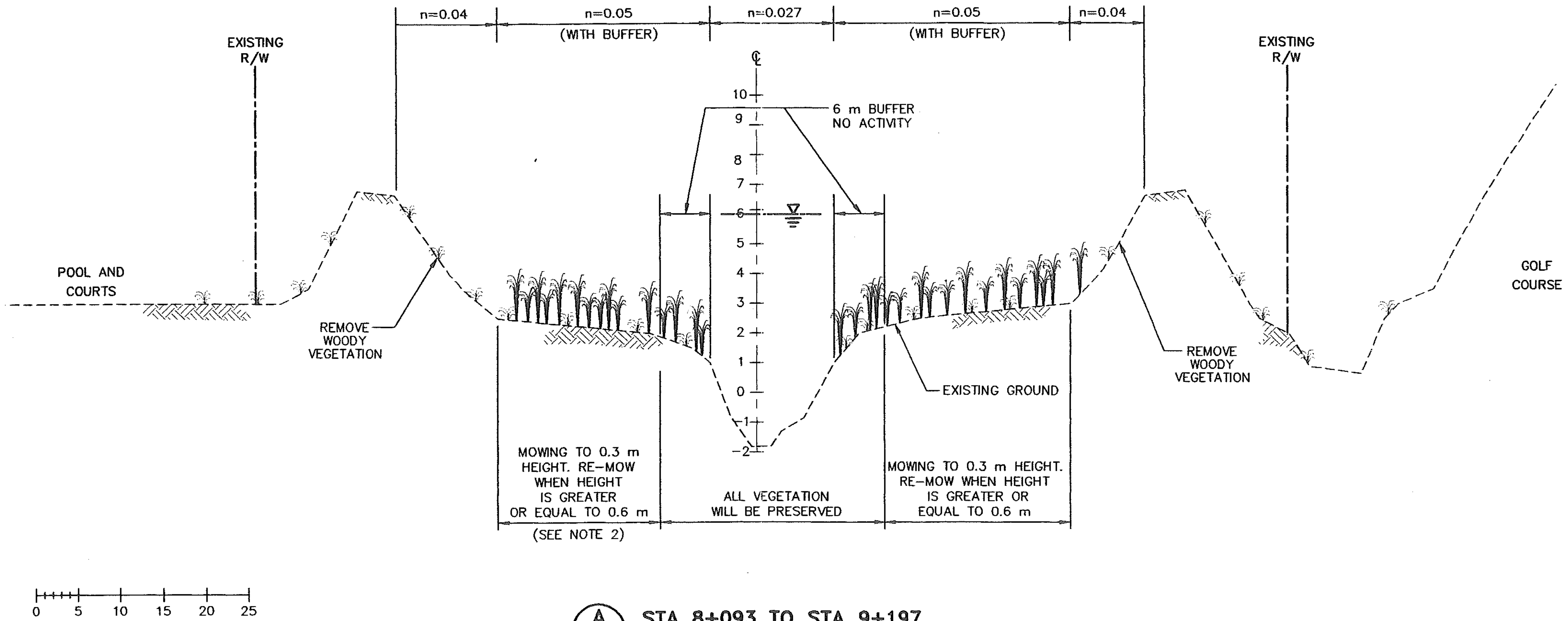
LOWER GUADALUPE RIVER
FLOOD PROTECTION PROJECT
STA 9+290 TO STA 10+127
TYPICAL SECTION

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE N.T.S.

FIGURE D–6



(A/–) STA 8+093 TO STA 9+197
HIGHWAY 237 TO TASMAN DRIVE
REACH F
NTS

▽ DESIGN WATER SURFACE

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

1. SECTION CUT LOOKING UPSTREAM
2. BRIDGE TRANSITION AREAS FOR ALL REACHES REQUIRE SPECIAL VEGETATION MANAGEMENT TREATMENT 30 m (100 ft) UPSTREAM TO 30 m (100 ft) DOWNSTREAM FROM BRIDGE FACES
3. SEDIMENT MANAGEMENT: EXCAVATED MATERIAL TO BE REMOVED FROM PROJECT

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DATE
PROJECT ENGINEER

LOWER GUADALUPE RIVER
FLOOD PROTECTION PROJECT
STA 8+093 TO STA 9+197
TYPICAL SECTION

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE N.T.S.

FIGURE D-7

[NOT FOR CONSTRUCTION]

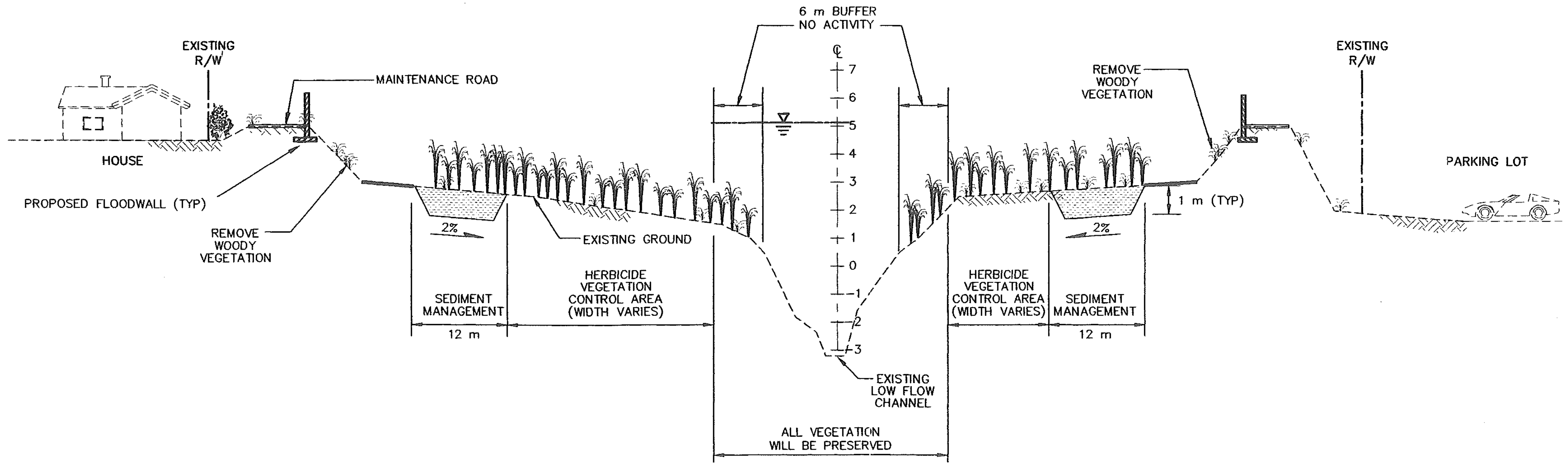
Metric

ROJECT: 153735
WG NAME:Acad\Rprt\OM_XS\D7.dwg
-REF(S):Acad\Xrefs\SC-bdr3.dwg

A B C D E F G H

4 3 2 1

Metric



0 5 10 15 20 25

(A/–) STA 7+100 TO STA 7+965
GOLD STREET TO ROUTE 237
REACH G (STA 7+300)
NTS

▽ DESIGN WATER SURFACE

[NOT FOR CONSTRUCTION]

PROJECT: 153735
DWG NAME: Acad\Rprt\OM_XS\D8.dwg
X-REF(S): Acad\Xrefs\SC-bdr3.dwg

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES
1. SECTION CUT LOOKING UPSTREAM
2. BRIDGE TRANSITION AREAS FOR ALL REACHES REQUIRE SPECIAL VEGETATION MANAGEMENT TREATMENT 30 m (100 ft) UPSTREAM TO 30 m (100 ft) DOWNSTREAM FROM BRIDGE FACES
3. SEDIMENT MANAGEMENT: EXCAVATED MATERIAL TO BE REMOVED FROM PROJECT
4. CUT VEGETATION MAY BE MULCHED IN CHANNEL AS A BEST MANAGEMENT PRACTICE

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DRAWN JAM
CHECKED EG

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
DATE
PROJECT ENGINEER

LOWER GUADALUPE RIVER
FLOOD PROTECTION PROJECT
STA. 7+100 TO STA. 7+965
TYPICAL SECTION

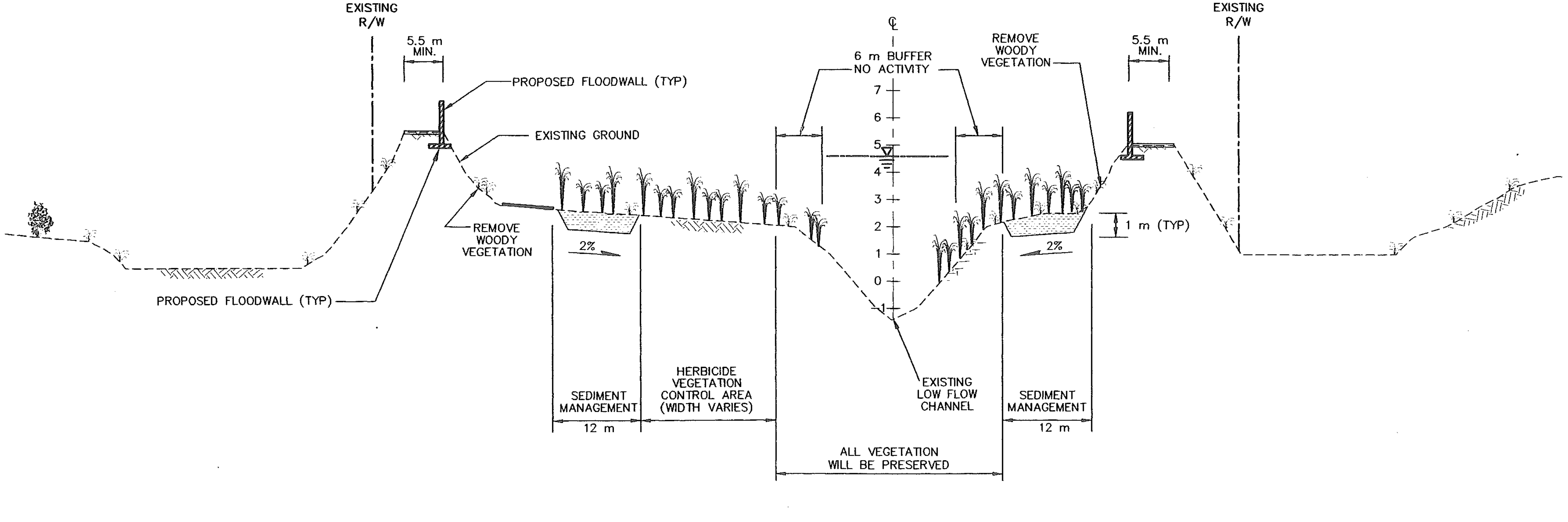
VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE
N.T.S.

FIGURE
D-8

Metric

[NOT FOR CONSTRUCTION]



Ⓐ STA 7+032 TO STA 7+100
U.P.R.R. TO GOLD STREET
REACH G
NTS

DESIGN WATER SURFACE

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES
1. SECTION CUT LOOKING UPSTREAM

2. BRIDGE TRANSITION AREAS FOR ALL REACHES REQUIRE SPECIAL VEGETATION MANAGEMENT TREATMENT 30 m (100 ft) UPSTREAM TO 30 m (100 ft) DOWNSTREAM FROM BRIDGE FACES

3. SEDIMENT MANAGEMENT: EXCAVATED MATERIAL TO BE REMOVED FROM PROJECT

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DRAWN JAM
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Santa Clara Valley Water District
ACCEPTED BY DISTRICT
PROJECT ENGINEER
DATE

LOWER GUADALUPE RIVER
FLOOD PROTECTION PROJECT
STA. 7+032 TO STA. 7+100
TYPICAL SECTION

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE N.T.S.

FIGURE D-9

PROJECT: 153735
DWG NAME:ACAD\RPRT\OM_XS\D9.dwg
X-REF(S):Acad\Xrefs\SC-bdr3.dwg

Appendix E

Appendix E
Cost Estimate Tables

Appendix E, Cost Estimates
Lower Guadalupe River Flood Protection Project

E.1 General Assumptions for Construction Cost Estimates

Below are general assumptions that were made when preparing the following cost estimate summary tables (Tables E-1 through E-8) for the Baylands and Reaches A through G.

1. Clearing and grubbing include the areas of raised levees and are based on an average width of 15 m (49 ft) for east and west levees.
2. Soil excavation is in accordance with typical levee sections shown on Sheets 26 and 27 (refer to Appendix F, Engineering Drawings of Proposed Project). No cost has been included for the handling of hazardous materials.
3. Imported fill is based on raising levees to the new design freeboard elevation, including new maintenance ramps, and completely reconstructing the west levee from Station 8 + 200 to Station 8 + 500 and from Station 9 + 225 to Station 10 + 100. A compaction loss of 15 percent was used to determine the quantity.
4. Sediment removal will be performed as described in Chapter 6 of this document. No cost has been included for the handling of hazardous materials.
5. Armoring aggregate of 0.15 m (6 in) is to be placed on top of levee (maintenance road) and access ramps at a minimum width of 5.5 m (18 ft).
6. Mechanically stabilized earth walls will be constructed along access ramps where there is insufficient separation from the maintenance road to provide for elevation differential at a 2:1 slope.
7. Major outfall modifications are assumed to be larger storm lines, which need replacement or extension with new headwalls and hardscape. Minor outfall modifications are typically smaller storm lines, which need to be extended or shortened to face of new headwall.
8. The Hetch Hetchy waterlines are assumed to be not relocated or modified. No sediment removal is to take place within 30 m (98 ft) upstream and downstream of these lines. Protect in place.
9. Vegetation management will include seeding, hydro or air seeding for large areas, with wood fiber mulch added.
10. On-site revegetation will be performed as described in Chapter 6 of this document.
11. Hardscape areas are assumed to be rock riprap unless otherwise indicated on plans.
12. Channel stabilizers are to be vortex rock weirs. Weir and footer boulder dimensions were assumed. Details will be refined in final design.
13. For Reach A, permanent easements will be approximately 7 m (23 ft) wide from approximately I-880 to Airport Parkway (approximately 1,900 m [6,230 ft]).
14. For Reaches B through G, temporary construction easements (TCEs) of typically 10 m (33 ft) of depth along parcels along the LGRP alignment. TCEs are planned for currently undeveloped land.
15. Portable pumps in Baylands are assured to be 50 cfs mobile units with diesel generators.
16. A general contingency is not included in these estimates.

Table E-1

Lower Guadalupe River Flood Protection Project

REACH A, U/S Interstate 880 Bridge to D/S Highway 101 Bridge

Cost Estimate Summary, 481 cms (17,000 cfs) Flood Protection

Item	Unit Cost	Unit	Quantity	Amount
Site Preparation				
Clearing and Grubbing	$1.4	m^2	18,000	$25,200
Earthwork				
Soil Excavation	$15	m^3	2,000	$30,000
Soil Fill	$20	m^3	10,400	$208,000
Channel Lining Modification				
Stepped Gabion Lining	$210	m^3	780	$163,800
Floodwalls	$600	m^3	300	$180,000
Rock Channel Lining	$100	m^3	5,450	$545,000
Armoring Aggregate (Maintenance Road)	$55	m^3	2,860	$157,300
Armoring Aggregate (Access Ramps)	$55	m^3	700	$38,500
Utilities				
Minor Outfall Modification	$10,000	each	2	$20,000
Vegetation Management[a]	$6	m^2	157,000	$942,000
Mobilization (10%)				$231,000
TOTAL CONSTRUCTION COSTS				**$2,540,800**
Design (10%)				$254,100
Geotechnical (5%)				$127,000
Inspection (10%)				$254,100
PERMANENT EASEMENT COSTS				$715,000
MITIGATION				
Revegetation (on site)				
SRA Planting between US 101 and Airport Parkway				$750,000
REACH A TOTAL COSTS				**$4,641,000**

---

[a] Assuming only 80% of the area will require treatment.

Table E-2
Lower Guadalupe River Flood Protection Project
REACH B, Highway 101 Bridge to Trimble Road Bridge
Cost Estimate Summary, 481 cms (17,000 cfs) Flood Protection

Item	Unit Cost	Unit	Quantity	Amount
Site Preparation				
Clearing and Grubbing	$1.4	m^2	25,000	$35,000
Earthwork				
Soil Excavation	$15	m^3	9,000	$135,000
Soil Fill	$20	m^3	8,000	$160,000
Sediment Removal	$40	m^3	16,200	$648,000
Hydro-Seeding/Erosion Contol		LS		$125,000
Channel Lining Modification				
Armoring Aggregate (Maintenance Road)	$55	m^3	1,400	$77,000
Armoring Aggregate (Access Ramps)	$55	m^3	350	$19,300
Rock Slope Protection	$100	m^2	3,700	$370,000
Tie-Back Wall	$800	m^2	90	$72,000
Utilities				
Minor Outfall Modification	$10,000	ea	1	$10,000
Protect in Place	$2,500	ea	9	$22,500
Vegetation Management[a]	$6	m^2	50,000	$300,000
Mobilization (10%)		LS		$197,400
TOTAL CONSTRUCTION COSTS				**$2,171,200**
Design (10%)				$217,100
Geotechnical (5%)				$108,600
Inspection (10%)				$217,100
RIGHT-OF-WAY COSTS				$228,700
MITIGATION				
Revegetation (off site) Out-of kind mitigation constructed in Pond A4	$10	m^2	730	$7,300
REACH B TOTAL COSTS				**$2,950,000**

---

[a] Assuming only 80% of the area will require treatment.

Table E-3

Lower Guadalupe River Flood Protection Project

REACH C, Trimble Road Bridge to Montague Expressway Bridge

Cost Estimate Summary, 481 cms (17,000 cfs) Flood Protection

Item	Unit Cost	Unit	Quantity	Amount
Site Preparation				
Clearing and Grubbing	$1.4	m^2	55,000	$77,000
Earthwork				
Soil Excavation	$15	m^3	22,500	$337,500
Soil Fill	$20	m^3	38,000	$760,000
Engineered Fill	$25	m^3	11,000	$275,000
Sediment Removal	$40	m^3	50,000	$2,000,000
Hydro-Seeding/Erosion Control		LS		$275,000
Channel Lining Modification				
Mechanically Stabilized Earth 2.5 m ht.	$1,700	m	260	$442,000
Armoring Aggregate (Maintenance Road)	$55	m^3	3,100	$170,500
Armoring Aggregate (Access Ramps)	$55	m^3	450	$24,800
Armoring Aggregate (Depressed Maint. Rd)	$55	m^3	860	$47,300
Rock Slope Protection	$100	m^2	6,630	$663,000
Tie-Back Wall	$800	m^2	100	$80,000
Utilities				
Major Outfall Modification	$50,000	ea	4	$200,000
Protect in Place	$2,500	ea	4	$10,000
Vegetation Management[a]	$6	m^2	111,000	$666,000
Mobilization (10%)		LS		$602,800
TOTAL CONSTRUCTION COSTS				**$6,630,900**
Design (10%)				$663,100
Geotechnical (5%)				$331,500
Inspection (10%)				$663,100
RIGHT-OF-WAY COSTS				$0
Mitigation				
Revegetation (off site)				
Out-of-kind mitigation constructed in Pond A4	$10	m^2	730	$7,300
REACH C TOTAL COSTS				**$8,295,900**

---

[a] Assuming only 80% of the area will require treatment.

Table E-4

Lower Guadalupe River Flood Protection Project

REACH D, Montague Expressway Bridge to Hetch Hetchy Pipeline Crossing

Cost Estimate Summary, 481 cms (17,000 cfs) Flood Protection

Item	Unit Cost	Unit	Quantity	Amount
Site Preparation				
Clearing and Grubbing	$1.4	m^2	51,000	$71,400
Earthwork				
Soil Excavation	$15	m^3	26,000	$390,000
Soil Fill	$20	m^3	44,000	$880,000
Engineered Fill	$25	m^3	19,000	$475,000
Sediment Removal	$40	m^3	21,300	$852,000
Hydro-Seeding/Erosion Control		LS		$255,000
Channel Lining Modification				
Armoring Aggregate (Maintenance Road)	$55	m^3	2,850	$156,800
Armoring Aggregate (Access Ramps)	$55	m^3	430	$23,700
Armoring Aggregate (Depressed Maint. Rd)	$55	m^3	1,870	$102,900
Utilities				
Major Outfall Modification	$50,000	ea	5	$250,000
Minor Outfall Modification	$10,000	ea	5	$50,000
Protect in Place	$2,500	ea	2	$5,000
Vegetation Management[a]	$6	m^2	88,000	$528,000
Mobilization (10%)	LS			$404,000
TOTAL CONSTRUCTION COSTS				**$4,443,800**
Design (10%)				$444,400
Geotechnical (5%)				$222,200
Inspection (10%)				$444,400
RIGHT-OF-WAY COSTS				$589,100
MITIGATION				
Revegetation (off site)				
In-kind mitigation constructed in Pond A4	$10	m^2	83,325	$833,250
REACH D TOTAL COSTS				**$6,977,200**

---

[a] Assuming only 80% of the area will require treatment.

Table E-5

Lower Guadalupe River Flood Protection Project

REACH E, Hetch Hetchy Pipeline Crossing to Tasman Drive Bridge

Cost Estimate Summary, 481 cms (17,000 cfs) Flood Protection

Item	Unit Cost	Unit	Quantity	Amount
Site Preparation				
Clearing and Grubbing	$1.4	m^2	27,000	$37,800
Earthwork				
Soil Excavation	$15	m^3	76,500	$1,147,500
Soil Fill	$20	m^3	98,000	$1,960,000
Engineered Fill	$25	m^3	11,000	$275,000
Sediment Removal	$40	m^3	24,200	$968,000
Hydro-Seeding/Erosion Control		LS		$135,000
Channel Lining Modification				
Mechanically Stabilized Earth 2 m ht.	$1,400	m	210	$294,000
Armoring Aggregate (Maintenance Road)	$55	m^3	1,500	$82,500
Armoring Aggregate (Access Ramps)	$55	m^3	225	$12,400
Armoring Aggregate (Depressed Maint Rd)	$55	m^3	440	$24,200
Rock Slope Protection	$100	m^2	800	$80,000
Utilities				
Major Outfall Modification	$50,000	ea	2	$100,000
Protect in Place	$2,500	ea	4	$10,000
Vegetation Management[a]	$6	m^2	51,000	$306,000
Mobilization (10%)		LS		$543,200
TOTAL CONSTRUCTION COSTS				$5,975,600
Design (10%)				$597,600
Geotechnical (5%)				$298,800
Inspection (10%)				$597,600
RIGHT-OF-WAY COSTS				$538,000
MITIGATION				
Revegetation (off site)				$0
In-kind mitigation constructed in Pond A4	$10	m^2	83,325	$833,250
REACH E TOTAL COSTS				$8,840,900

---

[a] Assuming only 80% of the area will require treatment.

Table E-6

Lower Guadalupe River Flood Protection Project

REACH F, Tasman Drive Bridge to Highway 237 Bridge

Cost Estimate Summary, 481 cms (17,000 cfs) Flood Protection

Item		Unit Cost	Unit	Quantity	Amount
Site Preparation					
	Clearing and Grubbing	$1.4	m^2	36,000	$50,400
Earthwork					
	Soil Excavation	$15	m^3	40,000	$600,000
	Soil Fill	$20	m^3	63,000	$1,260,000
	Sediment Removal	$40	m^3	0	$0
	Hydro-Seeding/Erosion Control		LS		$180,000
Channel Lining Modification					
	Mechanically Stabilized Earth 2 m ht.	$1,400	m	190	$266,000
	Floodwall	$500	m^3	1,900	$950,000
	Tie-Back Wall	$800	m^2	60	$48,000
	Armoring Aggregate (Maintenance Road)	$55	m^3	2,000	$110,000
	Armoring Aggregate (Access Ramps)	$55	m^3	335	$18,400
Utilities					
	Major Outfalls Modification	$50,000	ea	6	$300,000
	Minor Outfall Modification	$10,000	ea	2	$20,000
	Protect in Place	$2,500	ea	1	$2,500
Highway 237 Bridge Replacement					$8,028,300
Vegetation Management[a]		$6	m^2	40,000	$240,000
Mobilization (10%)			LS		$1,207,400
SUBTOTAL					$13,281,000
Design (10%)					$1,328,100
Geotechnical (5%)					$664,100
Inspection (10%)					$1,328,100
RIGHT-OF-WAY COSTS					$349,000
MITIGATION					
	Revegetation (off site)				$0
	In-kind mitigation constructed in Pond A4	$10	m^2	83,325	$833,250
REACH F TOTAL COSTS					$17,783,600

---

[a] Assuming only 80% of the area will require treatment.

Table E-7

Lower Guadalupe River Flood Protection Project

REACH G, Highway 237 Bridge to UPRR Bridge

Cost Estimate Summary, 481 cms (17,000 cfs) Flood Protection

Item	Unit Cost	Unit	Quantity	Amount
Site Preparation				
Clearing and Grubbing	\$1.4	m^2	30,000	\$42,000
Earthwork				
Soil Excavation	\$15	m^3	8,000	\$120,000
Soil Fill	\$20	m^3	22,500	\$450,000
Sediment Removal	\$40	m^3	13,100	\$524,000
Hydro-Seeding/Erosion Control		LS		\$150,000
Channel Lining Modification				
Mechanically Stabilized Earth 1.5 m ht.	\$1,100	m	75	\$82,500
Floodwall	\$500	m^3	3,700	\$1,850,000
Rock Slope Protection	\$100	m^2	120	\$12,000
Aggregate (Maint. Roads & Access Ramps)	\$55	m^3	1,900	\$104,500
Aggregate (Depressed Maint. Rd.)	\$55	m^3	540	\$29,700
Utilities				
Major Outfall Modification	\$50,000	ea	3	\$150,000
Minor Outfall Modification	\$10,000	ea	2	\$20,000
Protect In Place	\$2,500	ea	2	\$5,000
Vegetation Management[a]	\$6	m^2	50,000	\$300,000
Mobilization (10%)		LS		\$384,000
TOTAL CONSTRUCTION COSTS				\$4,223,700
Design (10%)				\$422,400
Geotechnical (5%)				\$211,200
Inspection (10%)				\$422,400
RIGHT-OF-WAY COSTS				\$338,900
Mitigation				
Revegetation (off site)				\$0
In-kind mitigation constructed in Pond A4	\$10	m^2	83,325	\$833,250
REACH G TOTAL COSTS				\$6,451,900

---

[a] Assuming only 80% of the area will require treatment.

Table E-8

Lower Guadalupe River Flood Protection Project

BAYLANDS, UPRR Bridge to Alviso Marina

Cost Estimate Summary, 481 cms (17,000 cfs) Flood Protection

Item	Unit Cost	Unit	Quantity	Amount
Levee				
Soil Off-Haul	$15	m^3	2,700	$40,500
Soil Fill	$20	m^3	9,400	$188,000
Sediment Removal	$40	m^3	1,850	$74,000
Armoring Aggregate (Maintenance Road)	$55	m^3	820	$45,100
Weir				
Clearing and Grubbing	$1.4	m^2	7,000	$9,800
Soil Excavation	$15	m^3	6,500	$97,500
Weir Concrete	$500	m^3	3,700	$1,850,000
Vegetation Management	$6	m^2	11,600	$69,600
Portable Pumps	$250,000	each	4	$1,000,000
Mobilization (10%)		LS		$337,500
TOTAL CONSTRUCTION COSTS				**$3,712,000**
Design (10%)				$371,200
Geotechnical (5%)				$185,600
Inspection (10%)				$371,200
RIGHT-OF-WAY COSTS				$0
MITIGATION COSTS				$0
BAYLANDS TOTAL COSTS				**$4,640,000**

Appendix F

Appendix F
Engineering Drawings of Proposed Project

Appendix F, Engineering Drawings for the Proposed Project

Sheet No.	Description
1	Location Map
2	General Notes, Abbreviations and Legend
3	Key Map
4	Plan and Profile, Station 7+008 to Station 7+400
5	Plan and Profile, Station 7+400 to Station 7+900
6	Plan and Profile, Station 7+900 to Station 8+600
7	Plan and Profile, Station 8+600 to Station 9+200
8	Plan and Profile, Station 9+200 to Station 9+800
9	Plan and Profile, Station 9+800 to Station 10+500
10	Plan and Profile, Station 10+500 to Station 11+100
11	Plan and Profile, Station 11+100 to Station 11+700
12	Plan and Profile, Station 11+700 to Station 12+300
13	Plan and Profile, Station 12+300 to Station 12+900
14	Plan and Profile, Station 12+900 to Station 13+600
15	Plan and Profile, Station 13+600 to Station 14+200
16	Plan and Profile, Station 14+200 to Station 14+900
17	Plan and Profile, Station 14+900 to Station 15+600
18	Plan and Profile, Station 15+600 to Station 16+300
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22	Plan View, Route 237
23	Plan View, Hetch Hetchy Pipeline
24	Station 7+008 to Station 7+995, Station 8+055 to Station 8+750, Typical Sections
25	Station 9+245 to Station 10+127, Typical Section
26	Station 10+127 to Station 11+795, Station 11+855 to Station 13+670, Typical Sections
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28	Station 15+720 to Station 17+010, Station 17+000 to Station 17+520, Typical Sections
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30	Typical Sections, Levee Modifications
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39	Station 16+306 and Station 17+548.50, Bridge Sections
40	237 Bridge Replacement, Construction Staging Plan, Typical Sections
41	237 Bridge Replacement , Construction Staging, Typical Sections
42	Alviso Baylands Improvements Plan
43	Alviso Slough Levee, Plan and Profile
44	West Levee Overflow Weir, Plan and Sections
45	Alviso Baylands Improvements, Details

Metric

MAP AND GENERAL PLAN

FOR

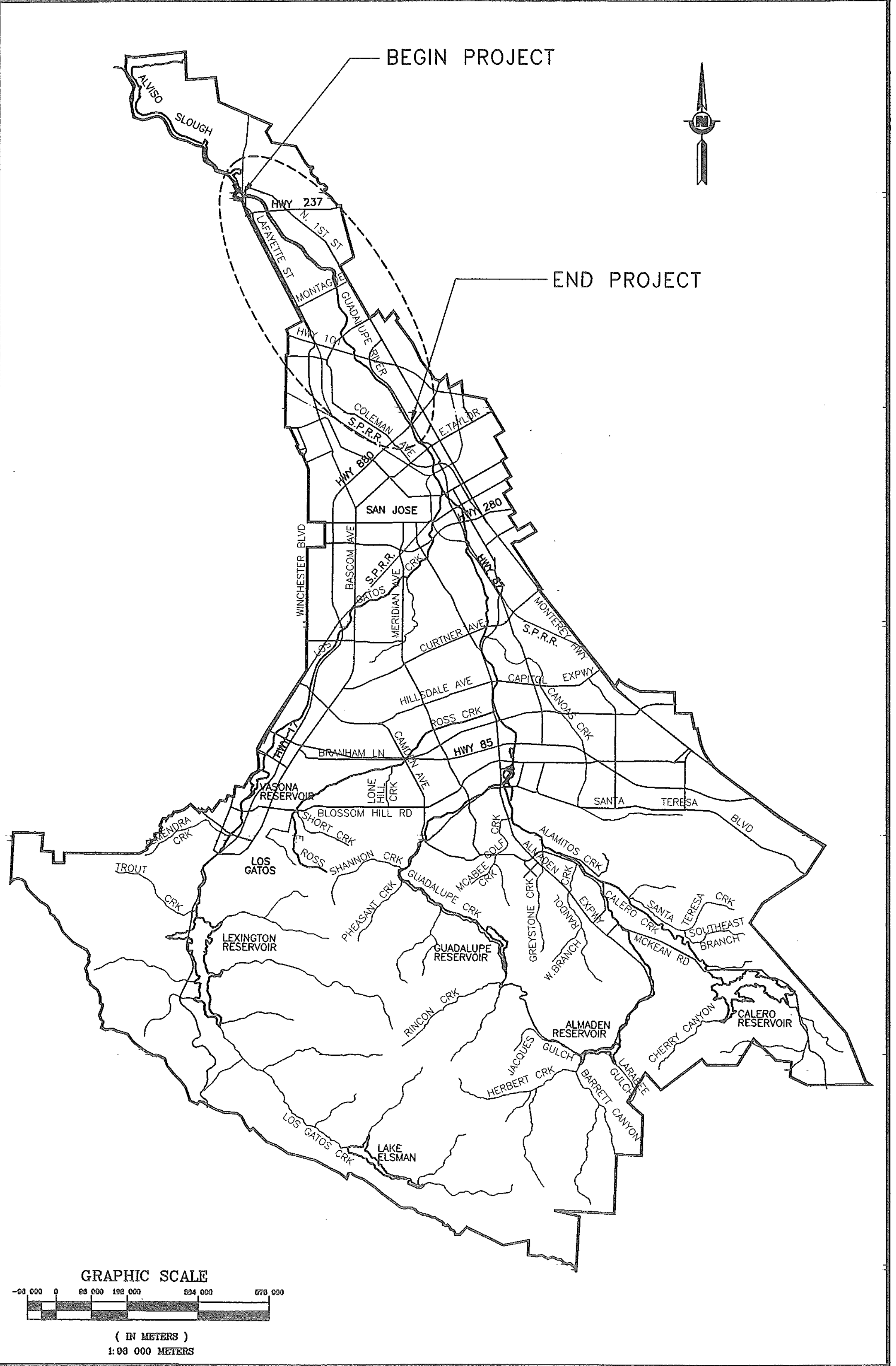
LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT

FROM INTERSTATE 880 TO UNION PACIFIC RAILROAD (UPRR) BRIDGE

PROJECT NO. 3015

Santa Clara Valley Water District

[NOT FOR CONSTRUCTION]



LOCATION MAP

INDEX

SHEET NO.	DESCRIPTION
1	COVER SHEET
2	GENERAL NOTES, ABBREVIATIONS, LEGEND
3	KEY MAP
4–20	PLAN AND PROFILE SHEETS
21–23	PLAN VIEW (1:500 SCALE) OF HIGHWAY 101, ROUTE 237, AND HETCH HETCHY WATER PIPELINE
24–29	TYPICAL SECTIONS
30–32	SECTIONS AND DETAILS
33–39	BRIDGE SECTIONS
40–41	237 BRIDGE REPLACEMENT CONSTRUCTION STAGING PLAN, TYPICAL SECTIONS
42	ALVISO BAYLANDS IMPROVEMENTS, PLAN
43	ALVISO SLOUGH LEVEE, PLAN AND PROFILE
44	WEST LEVEE OVERFLOW WEIR, PLAN AND SECTIONS
45	ALVISO BAYLANDS IMPROVEMENTS, DETAILS

PROJECT APPROVAL:

____

Assistant Operations Officer
Guadalupe Watershed
Watershed Management Division

ACCEPTED BY DISTRICT:

____

Senior Project Manager
Project Management Unit

DATE: August, 2001

David Michael Von Rueden
RCE 26428
EXP. 03/31/04
CIVIL

PREPARED BY:

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

ENGINEERING APPROVAL:

____

David M. Von Rueden — R.C.E. NO. 26428
CH2M HILL

DATE: ______________________________

PROJECT: 153735
FILE NAME: Acad\Rprt\S1-RPT.dwg
DATE: 6/19/01

Metric

GENERAL NOTES

1. All existing facilities, structures, trees, fences, landscaping, etc., designated "EXIST." or shown existing (dashed lines) are to remain. Only those specifically designated for removal as shown on the drawings, or as directed by the Engineer, shall be removed.

2. All references made to EAST or WEST and all cross–sections shown on the plans are viewed looking Upstream.

3. Electrical and telephone lines shown on the plans are overhead facilities, unless noted otherwise.

4. Locations and depths of existing underground utilities as shown on the plans are based on information from the existing utility plans and are to be considered as approximate only.

5. Prior to performing any work in the vicinity of existing underground utilities, the contractor shall verify their locations and depths and take proper precautions to avoid any damage to them. Call UNDERGROUND SERVICE ALERT at (800)–642–2444 for location.

6. Future settlement resulting from 1 meter of new levee fill placed on top of the levees was estimated as part of the preliminary geotechnical evaluation. This incremental settlement varies throughout the project and is not presented in the current design. It will however be included in the final design as appropriate.

DESIGN NOTES

1. Design discharge (Q) is 481.1 m^3/s (17,000 cfs)

   .....

2. Unit stresses for reinforced concrete are as follows:

   A. Concrete f'c MPa = N/A
   B. Steel fy MPa = N/A

3. Basis of Elevation:
   Vertical Control is NAVD 88

4. Basis of Bearing:
   Horizontal Datum: NAD 83
   Lambert Projection, (metric)
   California Coordinate System 83, Zone III.

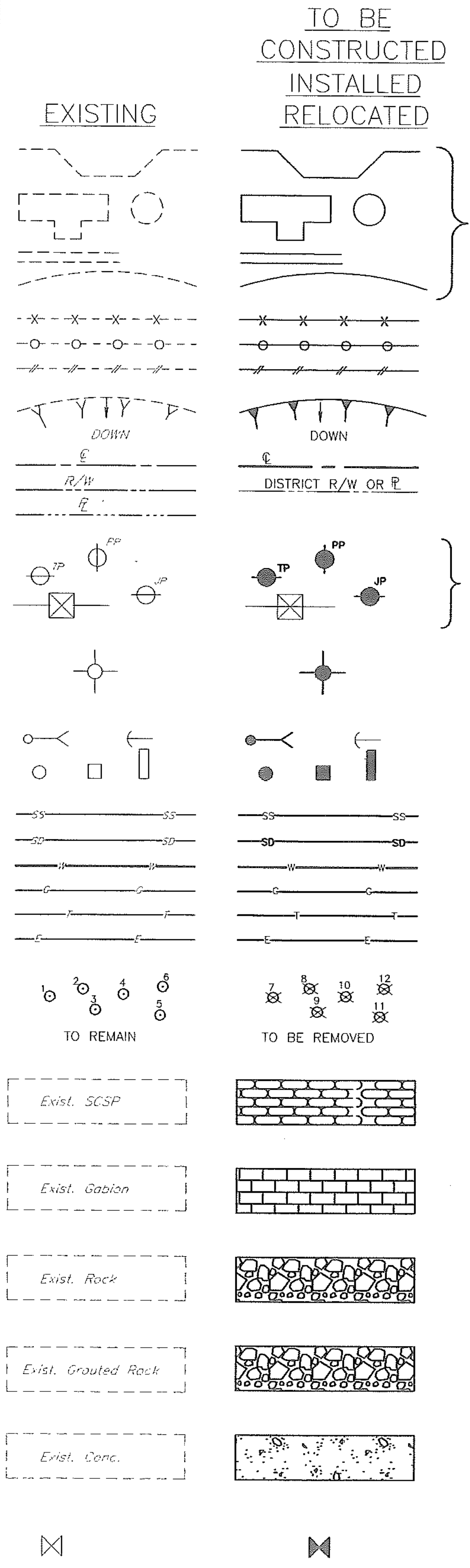
GENERAL ABBREVIATIONS

ALT	Alternate
ABN	Abandon
AB	Anchor Bolt, Aggregate Base
AC	Asphalt Concrete
ACI	American Concrete Institute
ALIGN	Alignment
APPROX	Approximate
AVG	Average
ABUT	Abutment
ASSY	Assembly
ACP	Asbestos Cement Pipe
ASPH	Asphalt
AP	Access Point
BC	Begin Curve
BF	Both Faces
BM	Bench Mark
BRNG	Bearing
BR	Bridge
BW	Barbed Wire
BK	Bank
BLDG	Building
BIT	Bituminous
BOT	Bottom
C	Curve, Chord
CB	Catch Basin
CCP	Concrete Cylinder Pipe
CIP	Cast Iron Pipe
CJ	Construction Joint
CLR	Clear, Clearance
CL–1.8	Chain Link Fence (Number = Height)
CMP	Corrugated Metal Pipe
CONC	Concrete
CONST	Construct, Construction
CONT	Continuous, Control
CYL	Cylinder
COL	Column
CRK	Creek
DEG(°)	Degree
DI	Drop Inlet
DIA	Diameter
DIP	Ductile Iron Pipe
DR	Drive
D/S	Downstream
DBL	Double
DWG	Drawing(s)
DN	Down
DET	Detail
E	East
EJ	Expansion Joint
EA	Each
EC	End Curve
ELEV/EL	Elevation
ELECT	Electric, Electrical
ENGR	Engineer, Engineering
EP	Edge Of Pavement
ESMT	Easement
EXIST/EX	Existing
EXPWY	Expressway
E'LY	Easterly
EQ	Equal
EQU	Equation
FD	Found
FF	Far Face
FG	Finish Grade
FH	Fire Hydrant
FTG	Footing
FWY	Freeway
FB	Freeboard
G	Gas
GA	Gage, Gauge
GALV	Galvanized
GAP	Guy Anchor & Pole
GB	Grade Break
GP	Guy Pole
GFI	Ground Fault Interrupter
GR	Grade
GRND	Ground
GRP	Group
H	Height
H & T	Hub & Tack
HORIZ	Horizontal
HP	Hinge point, Horsepower
HWY	Highway
HK	Hook (Applied to rebar)
HW	Headwall
IRR	Irrigation
ID	Inside Diameter
IF	Inside Face
INV	Invert
IP	Iron Pipe
JP	Joint Pole
JT	Joint
JUNCT	Junction
L	Length
LN	Lane
LT	Left
LP	Lip Of Gutter
M	Meter (Measuring Device)
MAINT	Maintenance
MAX	Maximum
MFP	Modified Flood Plain
MH	Manhole
MIN	Minimum
MON	Monument
MATL	Material(s)
MEMB	Member
MTL	Metal
NGVD	National Geodetic Vertical Datum
N	North
N/A	Not Applicable, Not Available
NE	Northeast
NE'LY	Northeasterly
NF	Near Face
NIC	Not In Contract
NTS	Not To Scale
NW	Northwest
NW'LY	Northwesterly
N'LY	Northerly
OC	On Center
OD	Outside Diameter
OF	Outside Face
OH	Overhead
OPNG	Opening
PB	Pull Box
PCC	Portland Cement Concrete Point Of Compound Curve
PI	Point Of Intersection
POB	Point Of Begining
POT	Point Of Tangent
PP	Power Pole
PRC	Point Of Reverse Curve
PT	Point
PVC	Polyvinyl Chloride Pipe
PVMT	Pavement
PED	Pedestrian
R	Radius
RCB	Reinforced Concrete Box
RCP	Reinforced Concrete Pipe
RD	Road
REBAR	Reinforcing Steel Bar
REF	Reference (Refer)
REINF	Reinforcement, Reinforcing
REQ'D	Required
RET	Retaining
RT	Right
RTE	Route
RR	Railroad
RW	Retaining Wall
R/W	Right Of Way
S	South, Slope
SCSP	Sacked Concrete Slope Protection
SCHED	Schedule
SCVWD	Santa Clara Valley Water District
SD	Storm Drain, Standard Detail
SE	Southeast
SECT	Section
SE'LY	Southeasterly
SHT	Sheet
SPECS	Specifications
SS	Sanitary Sewer
STA	Station
STD	Standard
STL	Steel
STR	Structure
SW'LY	Southwesterly
SYM	Symmetrical
SW	Southwest
S'LY	Southerly
T	Tangent, Telephone
TBM	Temporary Bench Mark
TC	Top Of Curb
TCA	Temporary Construction Area
TCE	Temporary Construction Easement
TFC	Traffic
TOB	Top Of Bank
TOC	Toe Of Channel
TP	Telephone Pole, Turning Point
TPT–1	Test Pit (Number=Designation /Location)
TS	Traffic Signal
TV	Television (Cable Or Facility)
TW	Top Of Wall
TYP	Typical
UB	Utility Box
UC	Utility Conduit
UG	Underground
U/S	Upstream
U.S.A.C.E.	United States Army Corps of Engineers
USC&GS	United States Coastal & Geodetic Survey
VCP	Vitrified Clay Pipe
VERT	Vertical
W	With, Water, West, Width (Wide)
W/O	Without
WS	Water Surface
WT	Weight
WD	Wood (Wooden)
WSP	Water Surface Profile
WV	Water Valve
WW	Wing Wall
WWF	Welded Wire Fabric
W'LY	Westerly
X–Sect	Cross Section
Z	Zone

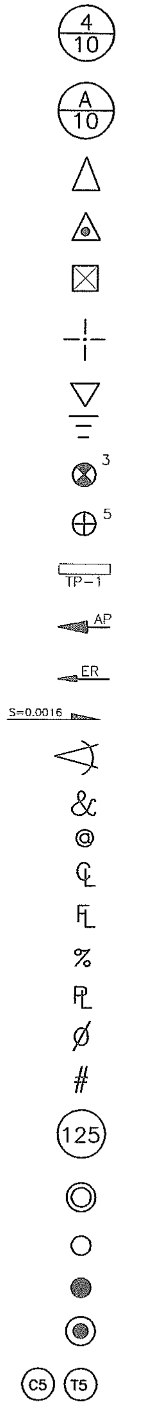
METRIC UNITS (SI)

A	ampere
°C	degree Celsius
km	kilometer
kV	kilovolt
kW	kilowatt
L	liter
mm	millimeter
m	meter, meters
m^2	square meter
m^3	cubic meter
m/s	meter per second
MPa	megapascal
s	second
Q	Design Discharge (m^3/s)

LEGEND



Facilities
Barbed Wire Fence
Chain Link Fence
Wooden Fence
Slope Of Bank
Center Line Or Control Line
Right Of Way
Property Line
Power Pole (PP)
Joint Pole (JP)
Telephone Pole (JP)
Tower
As Designated
Electrolier
Guy Anchor
Utilities Boxes
(As Abbreviated)
Sanitary Sewer
Storm Drain
Water Line
Gas Line
Telephone Line
Electric Line
Trees (Number Denotes Size & Kind Of Tree Shown In Table ⊖)
Sacked Concrete Lining
Gabion Lining
Rock Lining
Grouted Rock Lining
Concrete
Valve



4 Indicates Detail Number
10 Indicates Sheet Number On Which Detail Appears
A Indicates Section
10 Indicates Sheet Number On Which Section Appears
Curve, Central Angle
Survey Monument Or Horizontal Control Point
Bench Mark
Panel Point (Aerial)
Water Surface (Profile)
Drilled Soil Test Sample } Number=Test Log Number
Surface Soil Test Sample } Number=Test Log Number
Test Pit (Nr. = Location/Designation)
Access Point From Public Street, Highway Or Freeway
Exist. Ramp
Slope (meter/100 meters)
Angle
And
At
Control Line or Center Line
Flow Line
Percent
Property Line
Circular Diameter
Number
Numerical Point Designation
Monument Set As Noted
I.P. Set
Found Iron Pipe As Noted
Found St'd. City Monument
Curve Or Tangent Identification Number

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112–4524
(408)436–4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04

DATE
AUG. 2001
DESIGN
J.A.M.
DRAWN
J.A.M.
CHECKED
D.V.R.

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
PROJECT ENGINEER
DATE

LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT
GENERAL NOTES, ABBREVIATIONS AND LEGEND

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

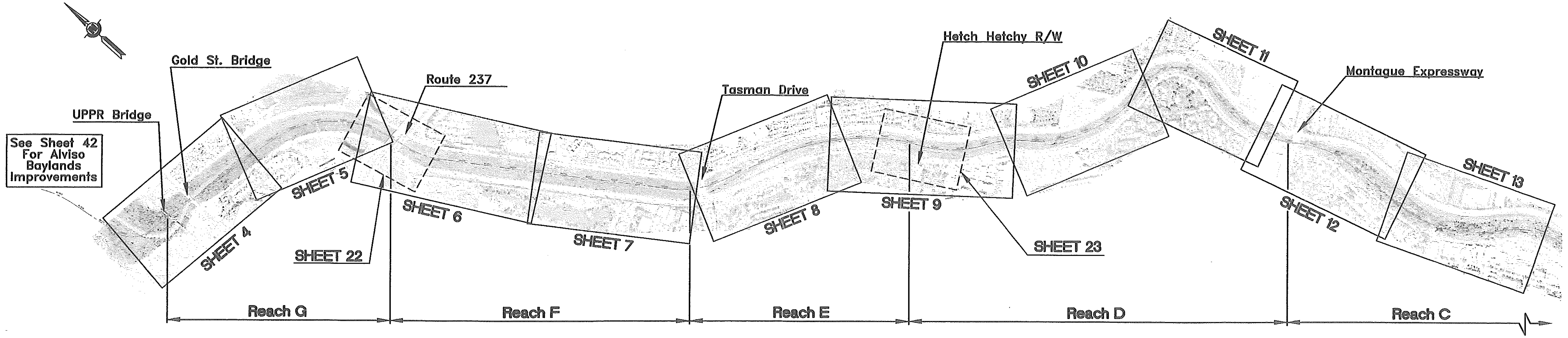
SCALE
AS SHOWN

SHEET
2
2 OF 45

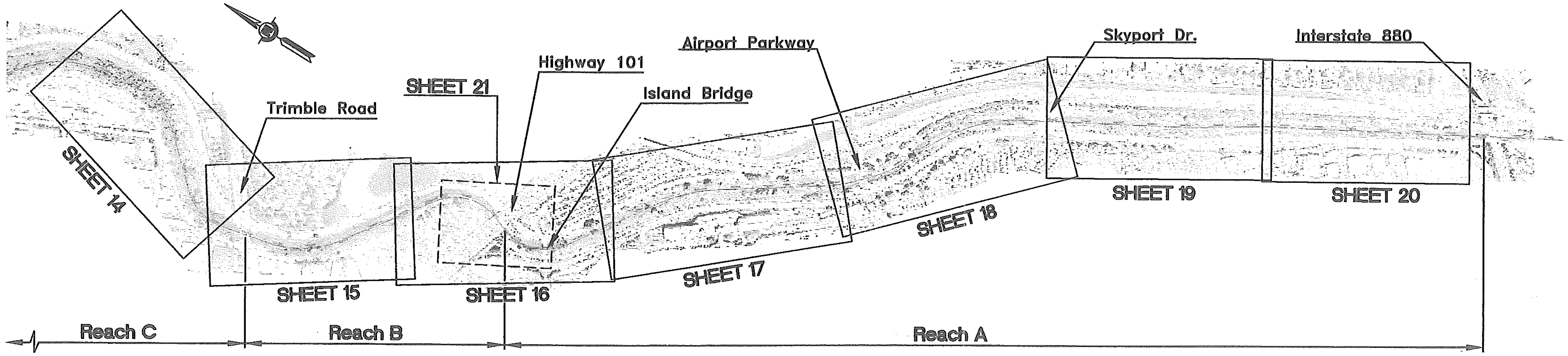
PROJECT: 153735
DWG NAME:Acad\Rpt\S2–RPT.dwg
X–REF(S):Acad\Xrefs\SC–bdr1.dwg

Metric

[NOT FOR CONSTRUCTION]



NOT TO SCALE



NOT TO SCALE

SPECIAL ABBREVIATIONS

ACM	ARTICULATED CONCRETE MAT
cms	CUBIC METER PER SECOND
m^3	CUBIC METER(S)
DEP	DEPRESSED
DSP	DESIGN SURFACE PROFILE
FOC	FACE OF CURB
ft (')	FEET (FOOT)
PG&E	PACIFIC GAS AND ELECTRIC
REVEG	REVEGETATION
SJWW	SAN JOSE WATER WORKS
SRA	SHADED RIVERINE AQUATIC
TEMP	TEMPORARY
UPRR	UNION PACIFIC RAILROAD
VEG	VEGETATION
YR	YEAR

— - — - —	CREEK CENTERLINE
— - - — - - —	PROPOSED SCVWD R/W LINE (PROPOSED SCVWD EASEMENT LINE – REACH A)
- - - - - -	EXISTING R/W LINE (NON SCVWD PROPERTY)
——OH——	OVERHEAD LINE
- - - -RW- - -	RECLAIMED WATER
————	PROPOSED LINE (TYP)
- - - - -	EXISTING LINE (TYP)
—·—·—	DESIGN SURFACE PROFILE

SPECIAL SYMBOLS

	EXISTING SLOPE OF BANK
	PROPOSED SLOPE OF BANK
	PROPOSED FLOODWALL (PLAN)
	PROPOSED LEVEE FILL (PLAN)
1 / 20–A A / 20–A	1 INDICATES DETAIL A INDICATES SECTION 20–A INDICATES SHEET NUMBER ON WHICH SECTION OR DETAIL APPEARS
	PROPOSED GATED FENCE FOR MAINTENANCE ROAD
	ROCK LINING WITH GROUND COVER
▨	SEDIMENT REMOVAL AREA
	VEGETATION MANAGEMENT

UTILITY DISPOSITION

①	PROTECT IN PLACE
2	REPLACE
3	RECONSTRUCT

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112–4524
(408)436–4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04
CIVIL

DATE	AUG. 2001
DESIGN	J.A.M.
DRAWN	J.A.M.
CHECKED	D.V.R.

Santa Clara Valley Water District

ACCEPTED BY DISTRICT

DATE

PROJECT ENGINEER

LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT

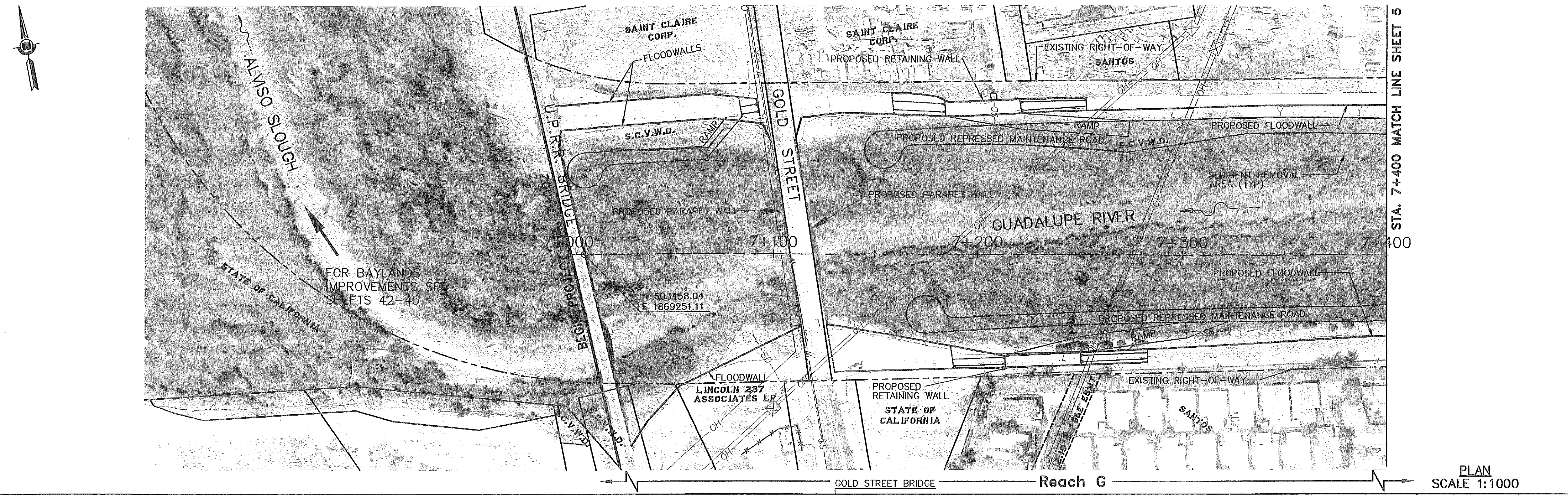
KEY MAP

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

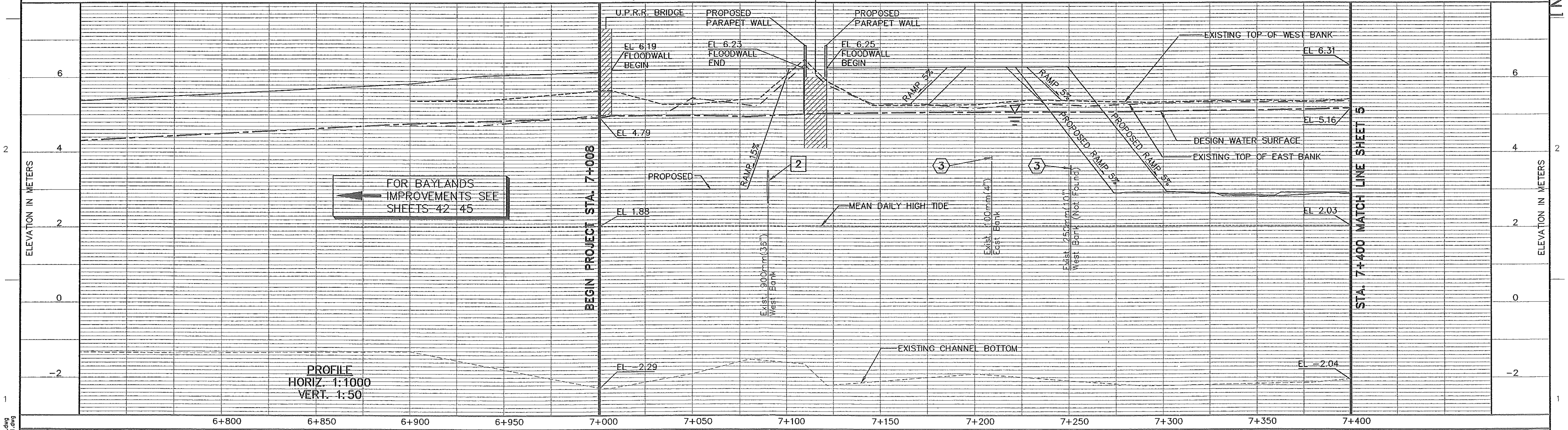
SCALE AS SHOWN

SHEET
3
3 OF 45

PROJECT: 153735
DWG NAME:Acad\Rprt\S3-RPT.dwg
X-REF(S):Acad\Xrefs\SC-bdr1.dwg



PLAN
SCALE 1:1000



PROFILE
HORIZ. 1:1000
VERT. 1:50

[NOT FOR CONSTRUCTION]

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES
1. WATER SURFACE ELEV. Q DESIGN = 481.4 cms (17,000 cfs)
2. FLOODWALLS TO BE ARCHITECTURALLY TREATED.
3. RIGHT-OF-WAY AND PROPERTY LINES DERIVED FROM SANTA CLARA VALLEY WATER DISTRICT (SCVWD), RIGHT-OF-WAY DRAWINGS AND PARCEL MAPS.
4. STORM DRAIN AND PUMP STATION OUTFALLS SHOWN ON PROFILE.
5. AERIAL PHOTOS TAKEN 08/20/1999, 72/in.
6. BRIDGE AND UTILITY INFORMATION TAKEN FROM RECORD DRAWINGS AND FROM AS-BUILTS.

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
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DATE AUG. 2001
DESIGN J.A.M
DRAWN J.A.M.
CHECKED D.V.R.

Santa Clara Valley Water District

ACCEPTED BY DISTRICT

PROJECT ENGINEER

DATE

LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT
PLAN AND PROFILE
STA 7+008 TO STA 7+400

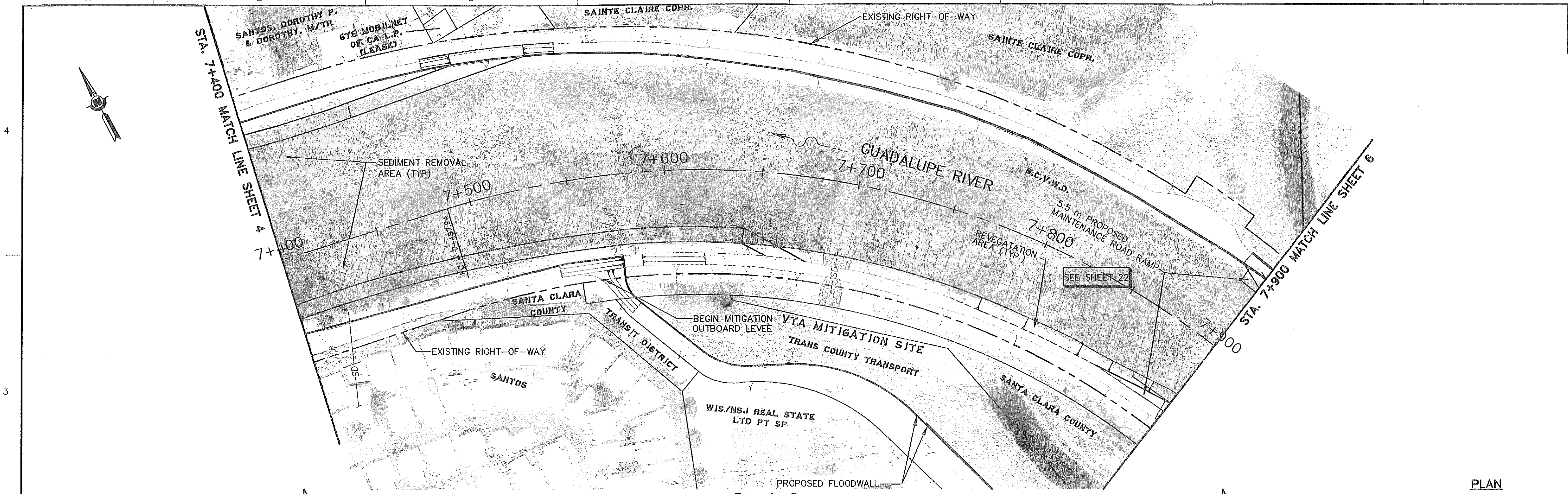
VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE
H 1:1000
V 1:50

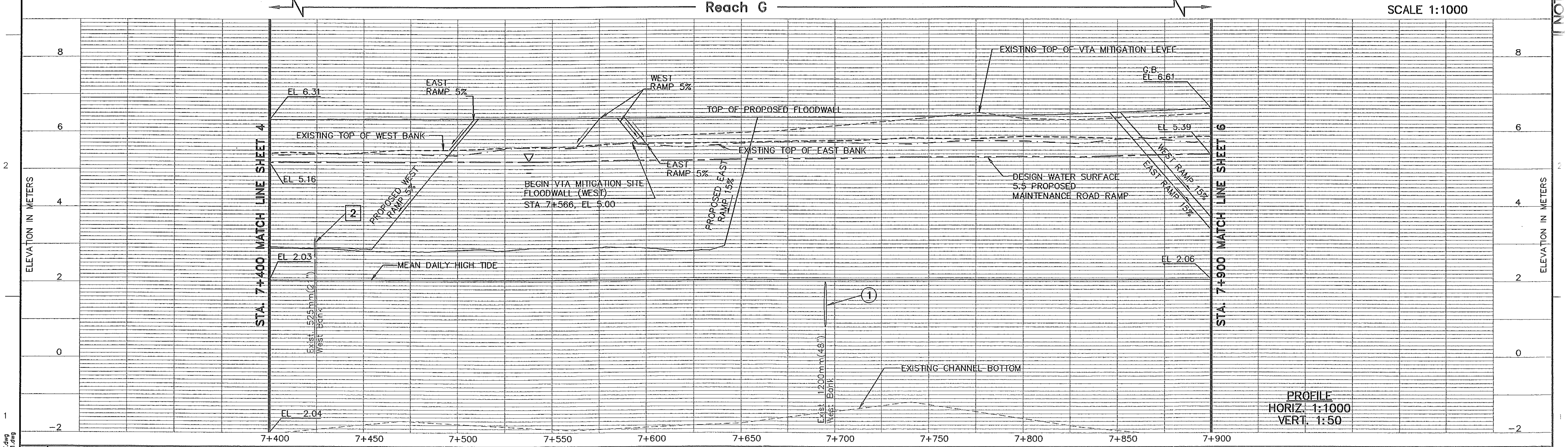
SHEET
4
4 OF 45

PROJECT: 153735
DWG NAME: Acad\Rprt\S4-RPT.dwg
X-REF(S): Acad\Xrefs\SC-bdr1.dwg

Metric



PLAN
SCALE 1:1000



Reach G
ELEVATION IN METERS
8
6
4
2
0
-2
STA. 7+400 MATCH LINE SHEET 4
STA. 7+900 MATCH LINE SHEET 6
EL 6.31
EL 5.16
EL 2.03
EL -2.04
EAST RAMP 5%
WEST RAMP 5%
EAST RAMP 5%
EXISTING TOP OF WEST BANK
TOP OF PROPOSED FLOODWALL
EXISTING TOP OF EAST BANK
EXISTING TOP OF VTA MITIGATION LEVEE
G.B. EL 6.61
EL 5.39
EL 2.06
WEST RAMP 15%
EAST RAMP 15%
DESIGN WATER SURFACE
5.5 PROPOSED MAINTENANCE ROAD RAMP
BEGIN VTA MITIGATION SITE FLOODWALL (WEST) STA 7+566, EL 5.00
PROPOSED WEST RAMP 5%
PROPOSED EAST RAMP 15%
2
MEAN DAILY HIGH TIDE
Exist. 525mm (21") West Bank
Exist. 1200mm (48") West Bank
①
EXISTING CHANNEL BOTTOM
7+400
7+450
7+500
7+550
7+600
7+650
7+700
7+750
7+800
7+850
7+900

PROFILE
HORIZ. 1:1000
VERT. 1:50

NOT FOR CONSTRUCTION

PROJECT: 153735
DWG NAME: Acad\Rprt\S5-RPT.dwg
X-REF(S): Acad\Xrefs\SC-bdr1.dwg

REV	DESCRIPTION	DATE	APPR

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CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04

DATE AUG. 2001
DESIGN J.A.M.
DRAWN J.A.M.
CHECKED D.V.R.

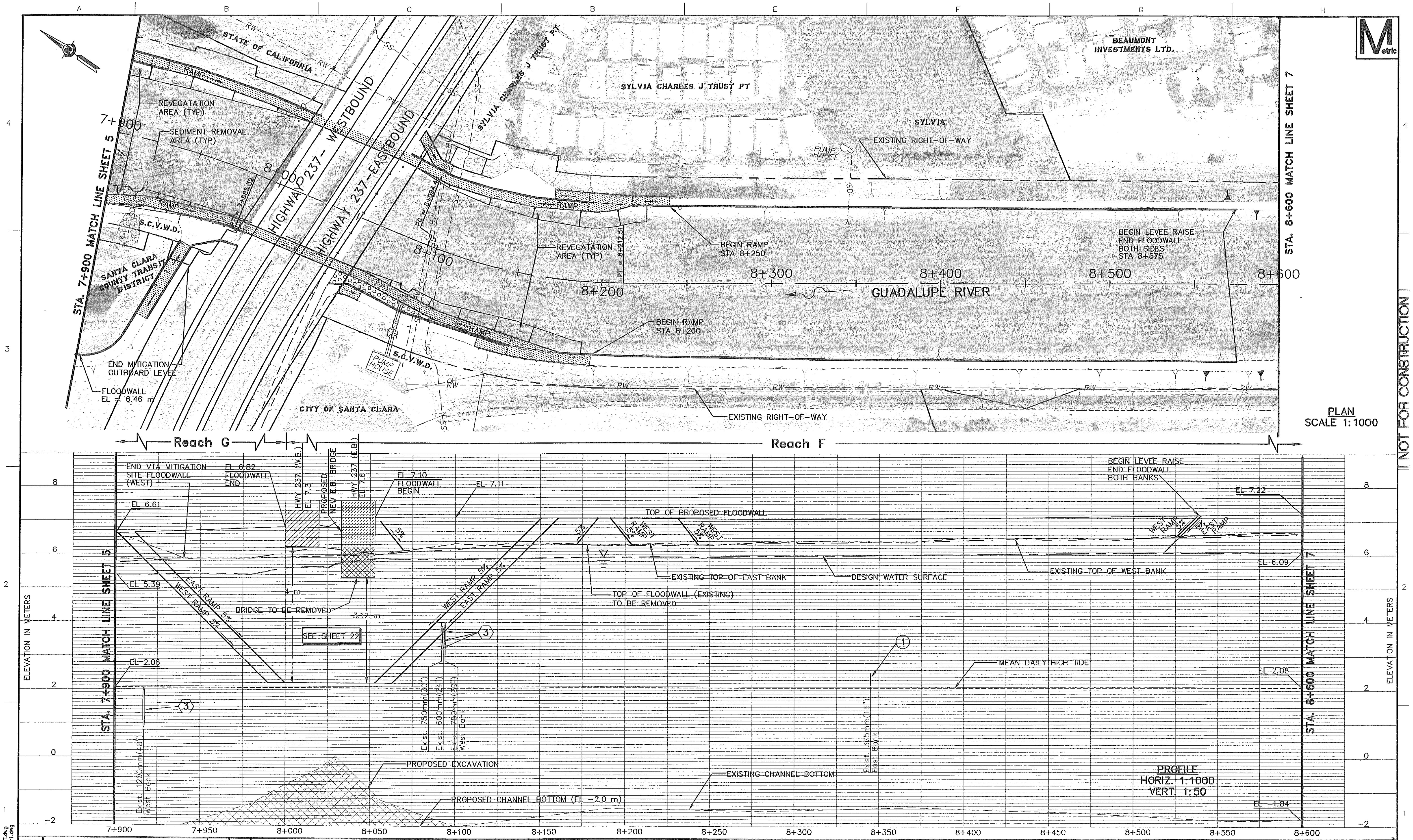
Santa Clara Valley Water District
ACCEPTED BY DISTRICT
DATE
PROJECT ENGINEER

LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT
PLAN AND PROFILE
STA 7+400 TO STA 7+900

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE
H 1:1000
V 1:50

SHEET
5
5 OF 45



(NOT FOR CONSTRUCTION)

PROJECT: 153735
DWG NAME: Acad\Rpt\S6-RPT.dwg
X-REF(S): Acad\Xrefs\SC-bdr1.dwg

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

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CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04

DATE AUG. 2001
DESIGN J.A.M.
DRAWN J.A.M.
CHECKED D.V.R.

Santa Clara Valley Water District

ACCEPTED BY DISTRICT

DATE

PROJECT ENGINEER

LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT

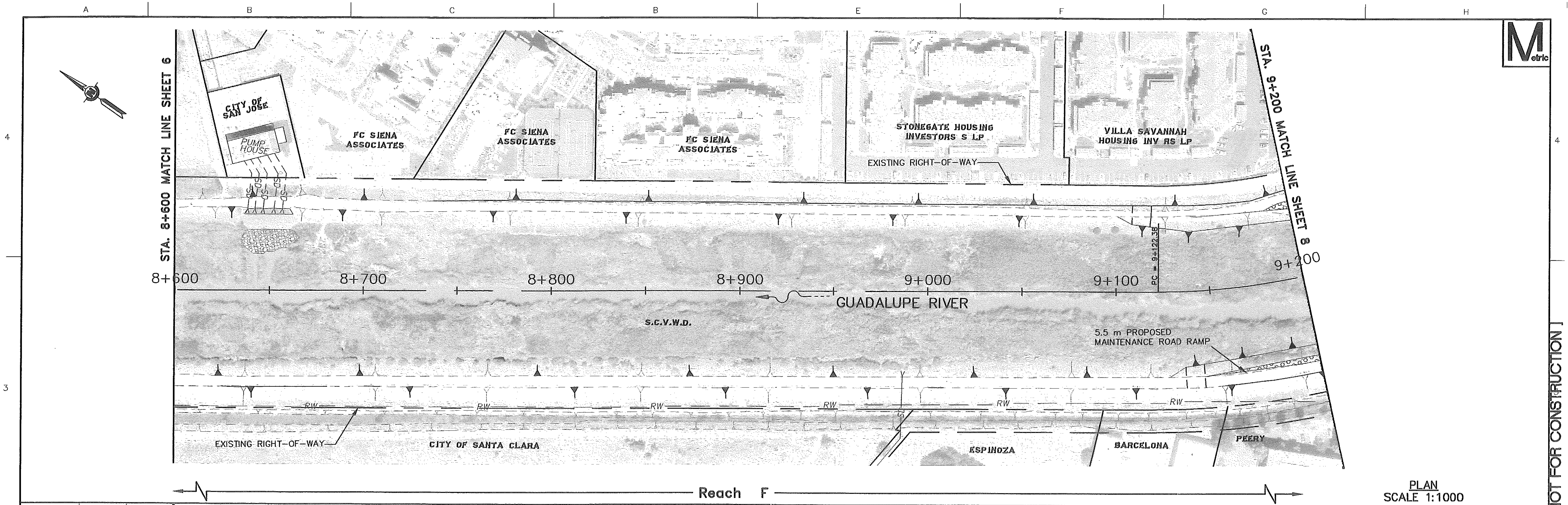
PLAN AND PROFILE
STA 7+900 TO STA 8+600

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

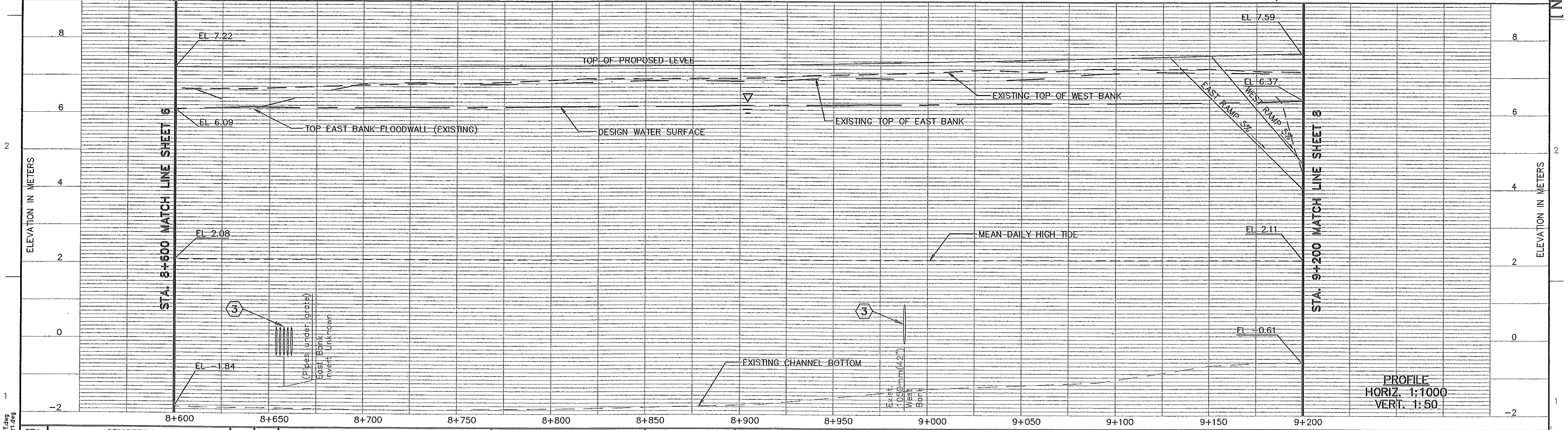
SCALE
H: 1:1000
V 1:50

SHEET
6
6 OF 45

Metric



PLAN
SCALE 1:1000



PROFILE
HORIZ. 1:1000
VERT. 1:50

[NOT FOR CONSTRUCTION]

REV	DESCRIPTION	DATE	APPR

PROJECT: 153735
DWG NAME: Acad\Rprt\S7-RPT.dwg
X-REF(S): Acad\Xrefs\SC-bdr1.dwg

REFERENCE INFORMATION AND NOTES

1. WATER SURFACE ELEV. Q DESIGN = 481.4 cms (17,000 cfs)
2. FLOODWALLS TO BE ARCHITECTURALLY TREATED.
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CH2MHILL

1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

REGISTERED PROFESSIONAL ENGINEER
David Michael Von Rueden
RCE 26428
EXP. 03/31/04
CIVIL
STATE OF CALIFORNIA

DATE AUG. 2001
DESIGN J.A.M.
DRAWN J.A.M.
CHECKED D.V.R.

Santa Clara Valley Water District

ACCEPTED BY DISTRICT

DATE

PROJECT ENGINEER

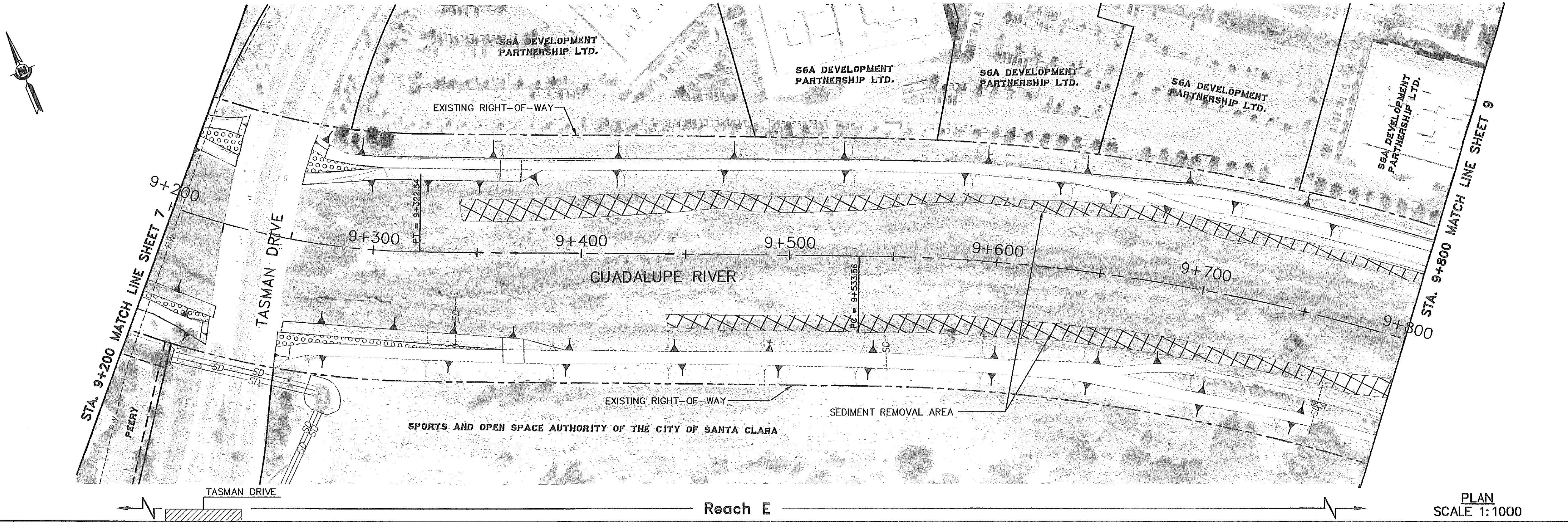
LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT

PLAN AND PROFILE
STA 8+600 TO STA 9+200

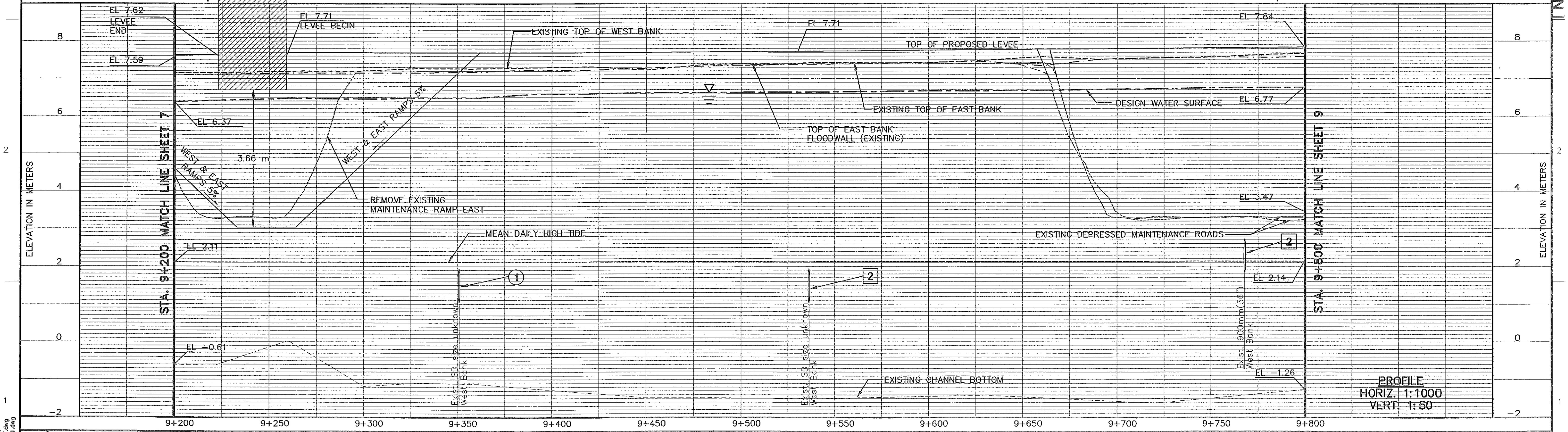
VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE
H: 1:1000
V 1:50

SHEET
7
7 OF 45


SGA DEVELOPMENT PARTNERSHIP LTD.
SGA DEVELOPMENT PARTNERSHIP LTD.
SGA DEVELOPMENT PARTNERSHIP LTD.
SGA DEVELOPMENT PARTNERSHIP LTD.
SGA DEVELOPMENT PARTNERSHIP LTD.
EXISTING RIGHT-OF-WAY
9+200
9+300
PT = 9+322.54
9+400
9+500
9+600
9+700
9+800
PC = 9+533.56
TASMAN DRIVE
GUADALUPE RIVER
STA. 9+200 MATCH LINE SHEET 7
STA. 9+800 MATCH LINE SHEET 9
PEERY
RW
SD
EXISTING RIGHT-OF-WAY
SEDIMENT REMOVAL AREA
SPORTS AND OPEN SPACE AUTHORITY OF THE CITY OF SANTA CLARA
TASMAN DRIVE
Reach E

PLAN
SCALE 1:1000



PROFILE
HORIZ. 1:1000
VERT. 1:50

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

1. WATER SURFACE ELEV. Q DESIGN = 481.4 cms (17,000 cfs)
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5. AERIAL PHOTOS TAKEN 08/20/1999, 72/in.
6. BRIDGE AND UTILITY INFORMATION TAKEN FROM RECORD DRAWINGS AND FROM AS-BUILTS.

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
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David Michael Von Rueden
RCE 26428
EXP. 03/31/04

DATE AUG. 2001
DESIGN J.A.M.
DRAWN J.A.M.
CHECKED EG

Santa Clara Valley Water District

ACCEPTED BY DISTRICT

PROJECT ENGINEER

DATE

LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT
PLAN AND PROFILE
STA 9+200 TO STA 9+800

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE
H: 1:1000
V 1:50

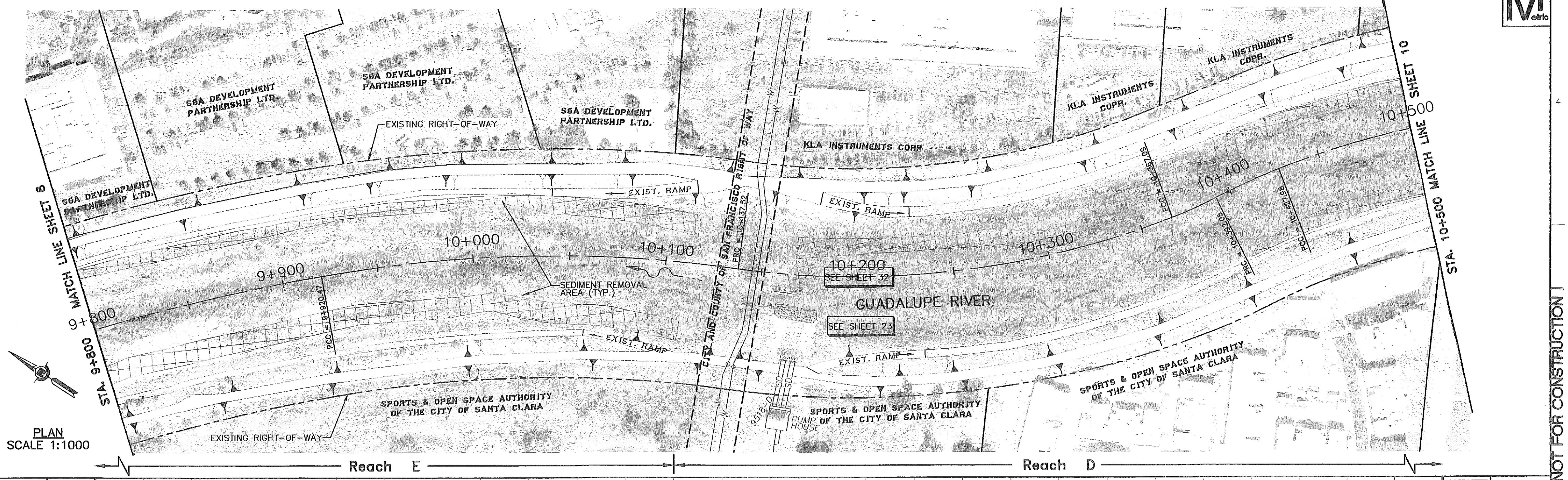
SHEET
8
8 OF 45

PROJECT: 153735
DWG NAME: Acad\Rpt\S8-RPT.dwg
X-REF(S): Acad\Xrefs\SC-bdr1.dwg

Metric

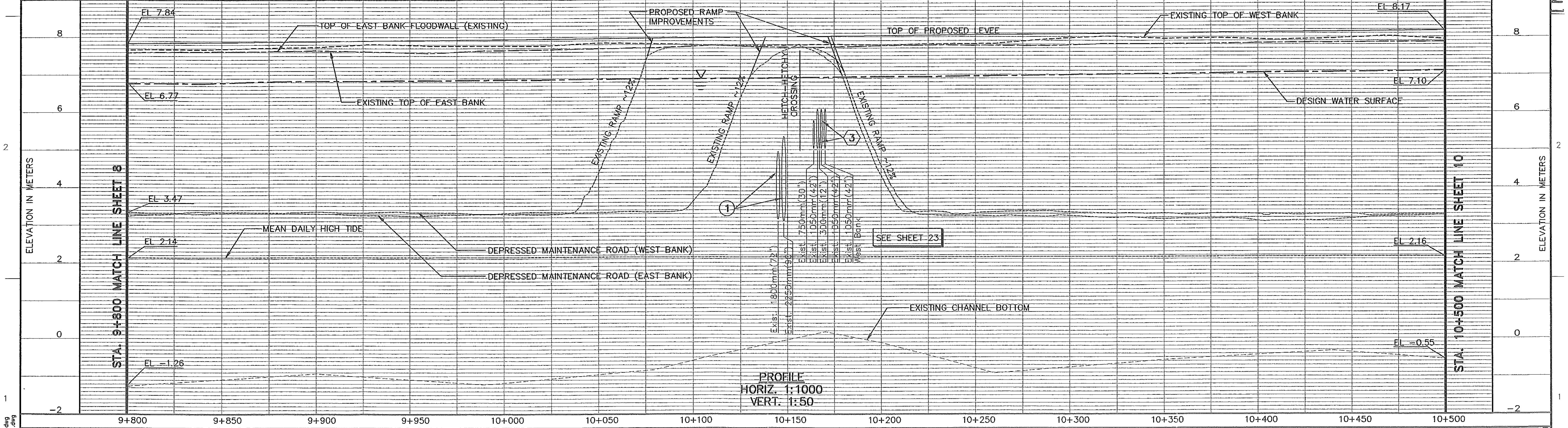
NOT FOR CONSTRUCTION

Metric



S&A DEVELOPMENT PARTNERSHIP LTD.
S&A DEVELOPMENT PARTNERSHIP LTD.
S&A DEVELOPMENT PARTNERSHIP LTD.
S&A DEVELOPMENT PARTNERSHIP LTD.
EXISTING RIGHT-OF-WAY
KLA INSTRUMENTS CORP
KLA INSTRUMENTS COPR.
KLA INSTRUMENTS COPR.
EXIST. RAMP
EXIST. RAMP
EXIST. RAMP
EXIST. RAMP
CITY AND COUNTY OF SAN FRANCISCO RIGHT OF WAY
PRC = 10+137.52
PCC = 9+920.47
PCC = 10+367.09
PRC = 10+396.05
PCC = 10+427.98
9+800
9+900
10+000
10+100
10+200
10+300
10+400
10+500
SEE SHEET 32
SEE SHEET 23
SEDIMENT REMOVAL AREA (TYP.)
GUADALUPE RIVER
SPORTS & OPEN SPACE AUTHORITY OF THE CITY OF SANTA CLARA
SPORTS & OPEN SPACE AUTHORITY OF THE CITY OF SANTA CLARA
SPORTS & OPEN SPACE AUTHORITY OF THE CITY OF SANTA CLARA
EXISTING RIGHT-OF-WAY
9518-D
PUMP HOUSE
SD
W
STA. 9+800 MATCH LINE SHEET 8
STA. 10+500 MATCH LINE SHEET 10
Reach E
Reach D

PLAN
SCALE 1:1000



PROFILE
HORIZ. 1:1000
VERT. 1:50

NOT FOR CONSTRUCTION

PROJECT: 153735
DWG NAME: Acad\Rprt\S9-RPT.dwg
X-REF(S): Acad\Xrefs\SC-bdr1.dwg

REV	DESCRIPTION	DATE	APPR

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DESIGN J.A.M.
DRAWN J.A.M.
CHECKED D.V.R.

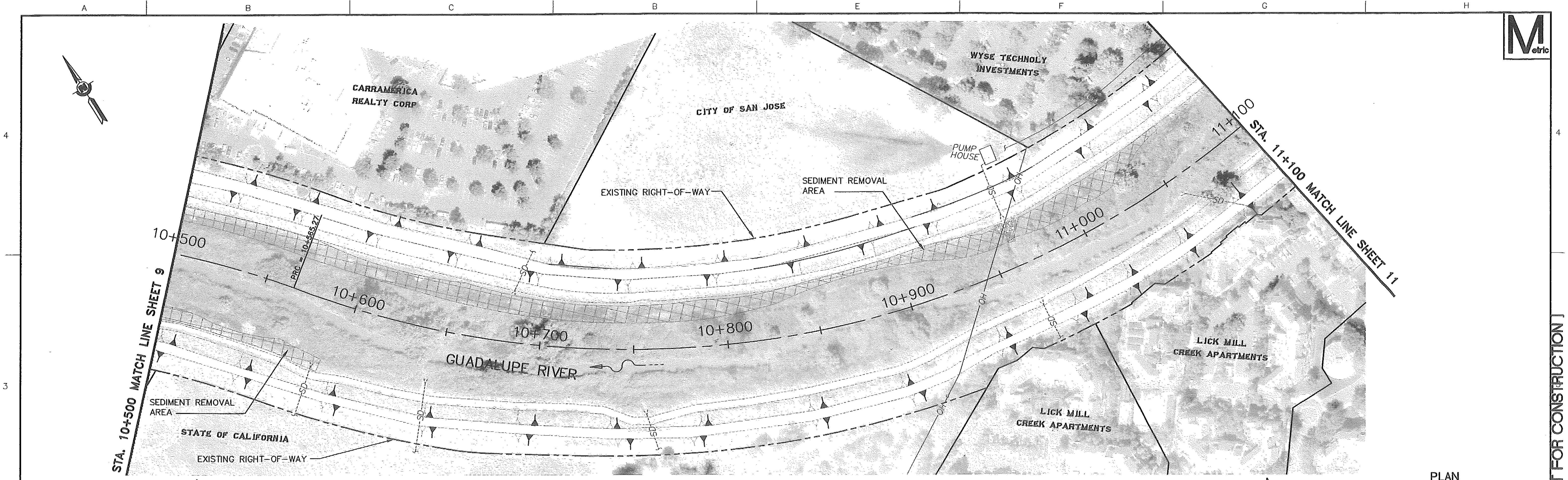
Santa Clara Valley Water District
ACCEPTED BY DISTRICT
PROJECT ENGINEER
DATE

LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT
PLAN AND PROFILE
STA 9+800 TO STA 10+500

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE
H: 1:1000
V 1:50

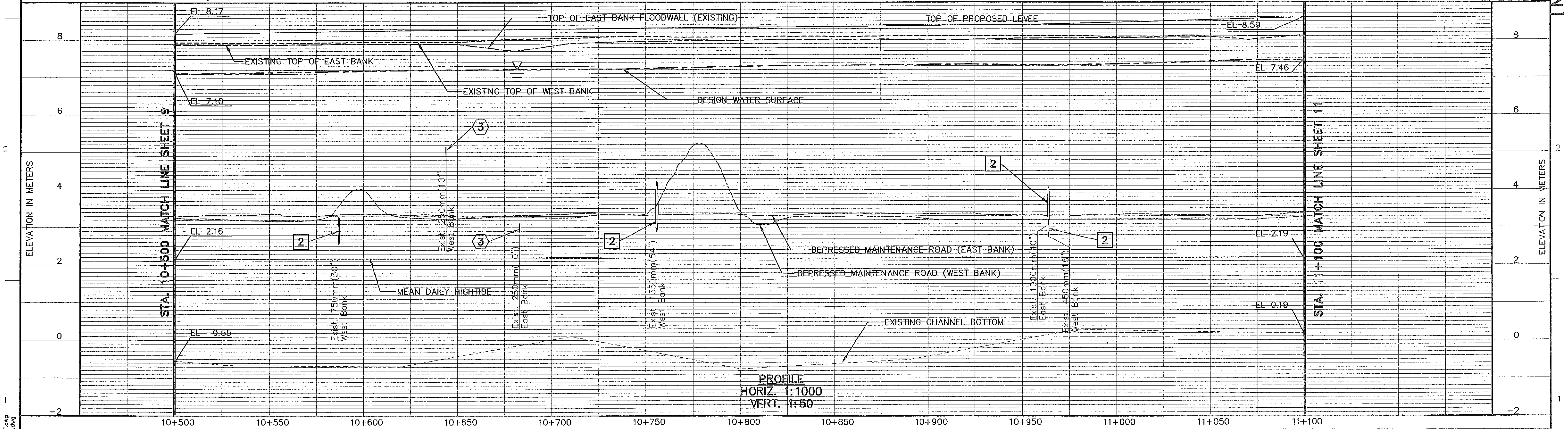
SHEET
9
9 OF 45



Reach D

PLAN
SCALE 1:1000

[NOT FOR CONSTRUCTION]



EL 8.17
TOP OF EAST BANK FLOODWALL (EXISTING)
TOP OF PROPOSED LEVEE
EL 8.59
EXISTING TOP OF EAST BANK
EL 7.46
EXISTING TOP OF WEST BANK
DESIGN WATER SURFACE
EL 7.10
STA. 10+500 MATCH LINE SHEET 9
STA. 11+100 MATCH LINE SHEET 11
3
Exist. 250mm(10") West Bank
2
Exist. 750mm(30") West Bank
3
Exist. 250mm(10") East Bank
2
Exist. 1350mm(54") West Bank
2
Exist. 1000mm(40") East Bank
Exist. 450mm(18") West Bank
2
DEPRESSED MAINTENANCE ROAD (EAST BANK)
DEPRESSED MAINTENANCE ROAD (WEST BANK)
EL 2.16
EL 2.19
MEAN DAILY HIGHTIDE
EXISTING CHANNEL BOTTOM
EL 0.19
EL -0.55
ELEVATION IN METERS
8
6
4
2
0
-2
10+500
10+550
10+600
10+650
10+700
10+750
10+800
10+850
10+900
10+950
11+000
11+050
11+100

PROFILE
HORIZ. 1:1000
VERT. 1:50

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

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DRAWN J.A.M.
CHECKED D.V.R.

Santa Clara Valley Water District
ACCEPTED BY DISTRICT

PROJECT ENGINEER

DATE

LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT

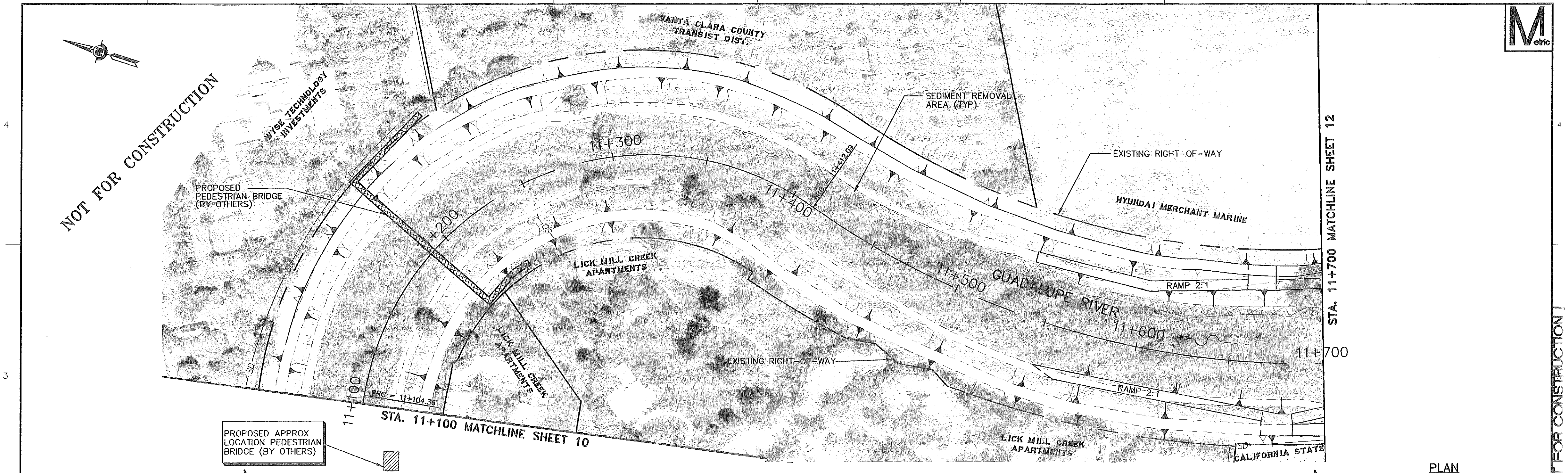
PLAN AND PROFILE
STA 10+500 TO STA 11+100

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

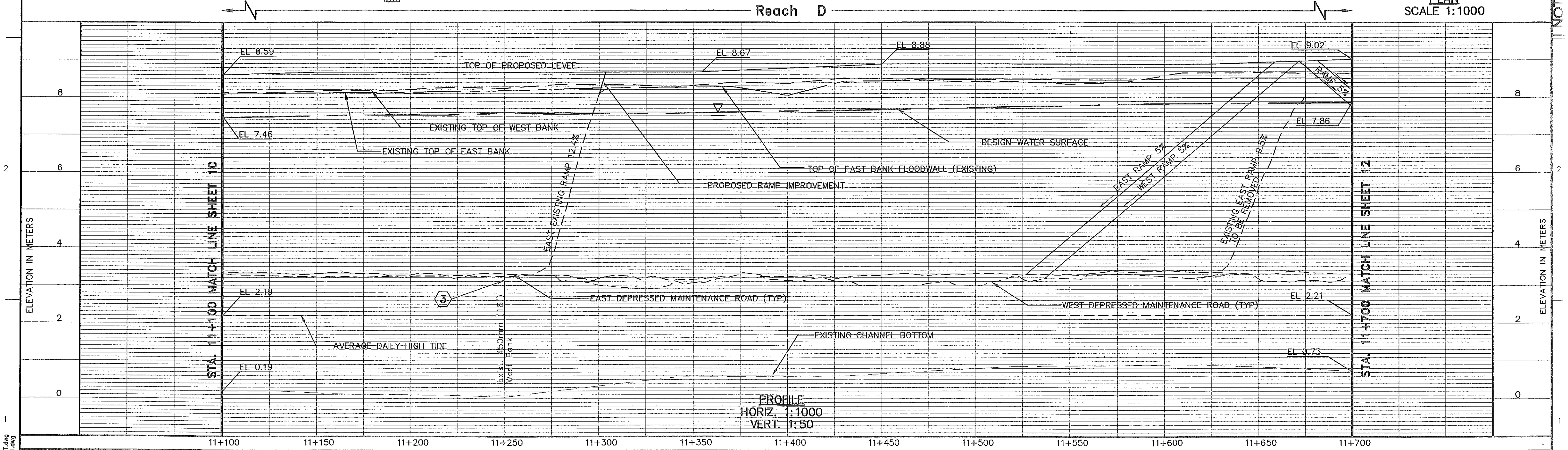
SCALE
H: 1:1000
V 1:50

SHEET
10
10 OF 45

PROJECT: 153735
DWG NAME:Acad\Rprt\S10-RPT.dwg
X-REF(S):Acad\Xrefs\SC-bdr1.dwg


NOT FOR CONSTRUCTION
WYSE TECHNOLOGY INVESTMENTS
SANTA CLARA COUNTY TRANSIST DIST.
SEDIMENT REMOVAL AREA (TYP)
EXISTING RIGHT-OF-WAY
HYUNDAI MERCHANT MARINE
PROPOSED PEDESTRIAN BRIDGE (BY OTHERS)
11+300
11+400
+200
PRC = 11+412.08
LICK MILL CREEK APARTMENTS
11+500
GUADALUPE RIVER
11+600
11+700
RAMP 2:1
RAMP 2:1
EXISTING RIGHT-OF-WAY
LICK MILL CREEK APARTMENTS
11+100
PRC = 11+104.36
STA. 11+100 MATCHLINE SHEET 10
LICK MILL CREEK APARTMENTS
CALIFORNIA STATE
SD
STA. 11+700 MATCHLINE SHEET 12
PROPOSED APPROX LOCATION PEDESTRIAN BRIDGE (BY OTHERS)
M etric

PLAN
SCALE 1:1000



PROFILE
HORIZ. 1:1000
VERT. 1:50

PROJECT: 153735
DWG NAME: Acad\Rprt\S11-RPT.dwg
X-REF(S): Acad\Xrefs\SC-bdr1.dwg

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

1. WATER SURFACE ELEV. Q DESIGN = 481.4 cms (17,000 cfs)
2. FLOODWALLS TO BE ARCHITECTURALLY TREATED.
3. RIGHT-OF-WAY AND PROPERTY LINES DERIVED FROM SANTA CLARA VALLEY WATER DISTRICT (SCVWD), RIGHT-OF-WAY DRAWINGS AND PARCEL MAPS.
4. STORM DRAIN AND PUMP STATION OUTFALLS SHOWN ON PROFILE.
5. AERIAL PHOTOS TAKEN 08/20/1999, 72/in.
6. BRIDGE AND UTILITY INFORMATION TAKEN FROM RECORD DRAWINGS AND FROM AS-BUILTS.

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04

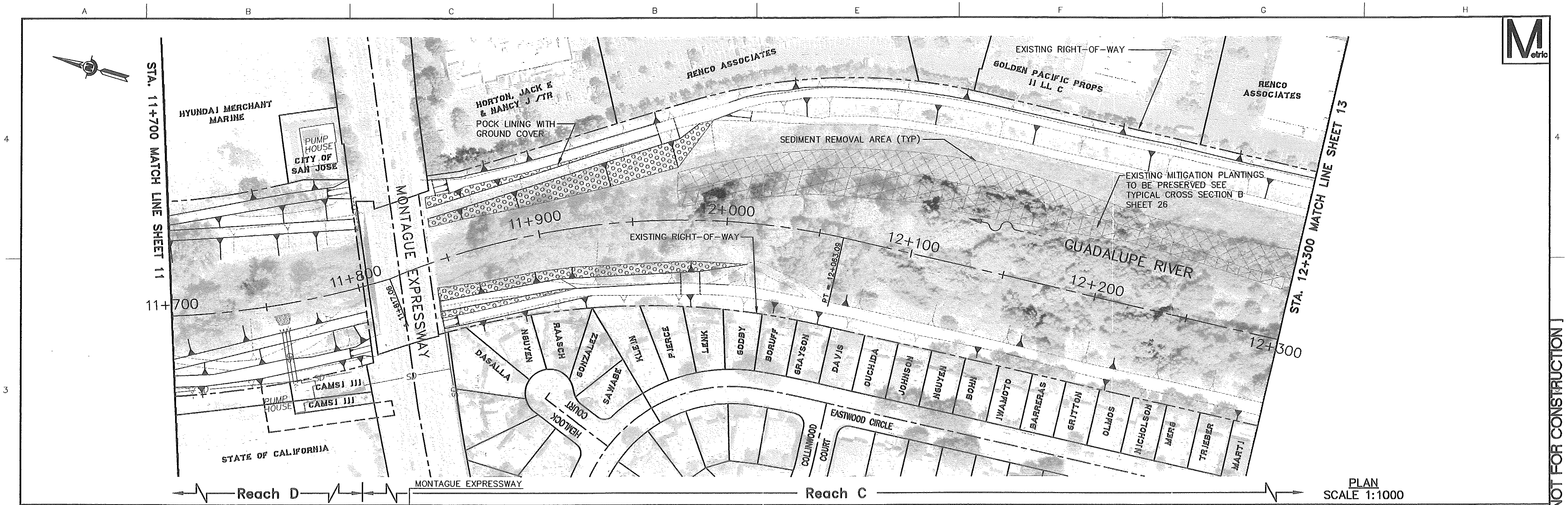
DATE AUG. 2001
DESIGN J.A.M.
DRAWN J.A.M.
CHECKED D.V.R.

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
PROJECT ENGINEER
DATE

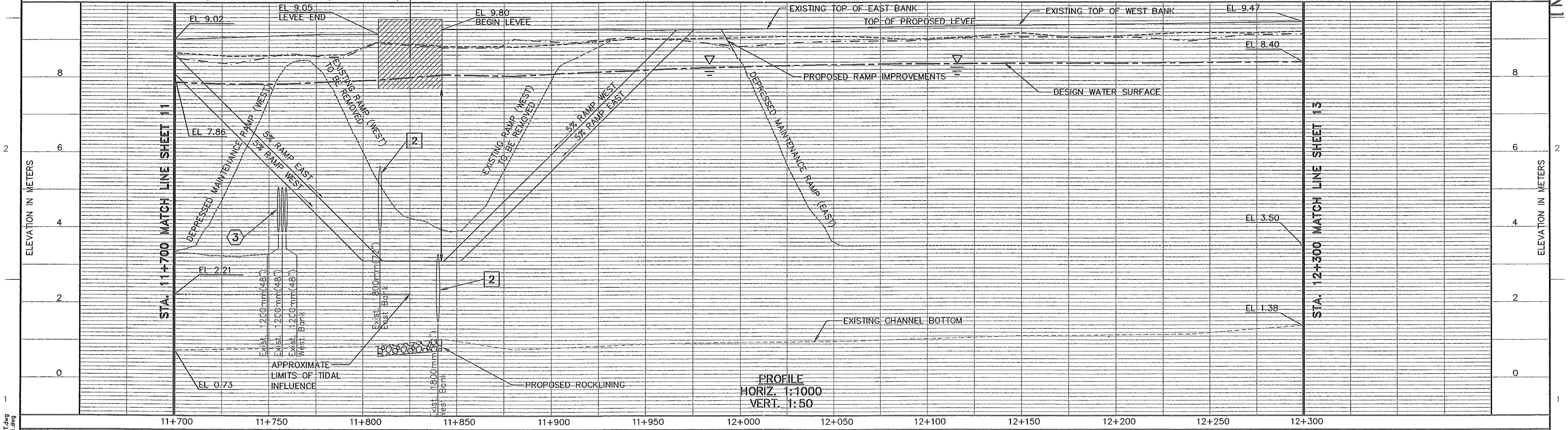
LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT
PLAN AND PROFILE
STA 11+100 TO STA 11+700

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE
H: 1:1000
V 1:50
SHEET
11
11 OF 45



PLAN
SCALE 1:1000


EL 9.02
EL 9.05
LEVEE END
EL 9.80
BEGIN LEVEE
EXISTING TOP OF EAST BANK
TOP OF PROPOSED LEVEE
EXISTING TOP OF WEST BANK
EL 9.47
EL 8.40
PROPOSED RAMP IMPROVEMENTS
DESIGN WATER SURFACE
EL 7.86
DEPRESSED MAINTENANCE RAMP (WEST)
5% RAMP EAST
5% RAMP WEST
EXISTING RAMP (WEST) TO BE REMOVED
EXISTING RAMP (WEST) TO BE REMOVED
5% RAMP WEST
5% RAMP EAST
DEPRESSED MAINTENANCE RAMP (EAST)
2
3
2
EL 3.50
EL 2.21
Exist. 1200mm (48") West Bank
Exist. 1200mm (48")
Exist. 1200mm (48")
Exist. 1800mm (72") East Bank
Exist. 1800mm (72") West Bank
EXISTING CHANNEL BOTTOM
EL 1.38
APPROXIMATE LIMITS OF TIDAL INFLUENCE
EL 0.73
PROPOSED ROCKLINING
STA. 11+700 MATCH LINE SHEET 11
STA. 12+300 MATCH LINE SHEET 13
ELEVATION IN METERS
8
6
4
2
0
11+700
11+750
11+800
11+850
11+900
11+950
12+000
12+050
12+100
12+150
12+200
12+250
12+300

PROFILE
HORIZ. 1:1000
VERT. 1:50

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

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4. STORM DRAIN AND PUMP STATION OUTFALLS SHOWN ON PROFILE.
5. AERIAL PHOTOS TAKEN 08/20/1999, 72/in.
6. BRIDGE AND UTILITY INFORMATION TAKEN FROM RECORD DRAWINGS AND FROM AS-BUILTS.

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04
CIVIL

DATE
AUG. 2001
DESIGN
J.A.M.
DRAWN
J.A.M.
CHECKED
D.V.R.

Santa Clara Valley Water District

ACCEPTED BY DISTRICT

DATE

PROJECT ENGINEER

LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT

PLAN AND PROFILE

STA 11+700 TO STA 12+300

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

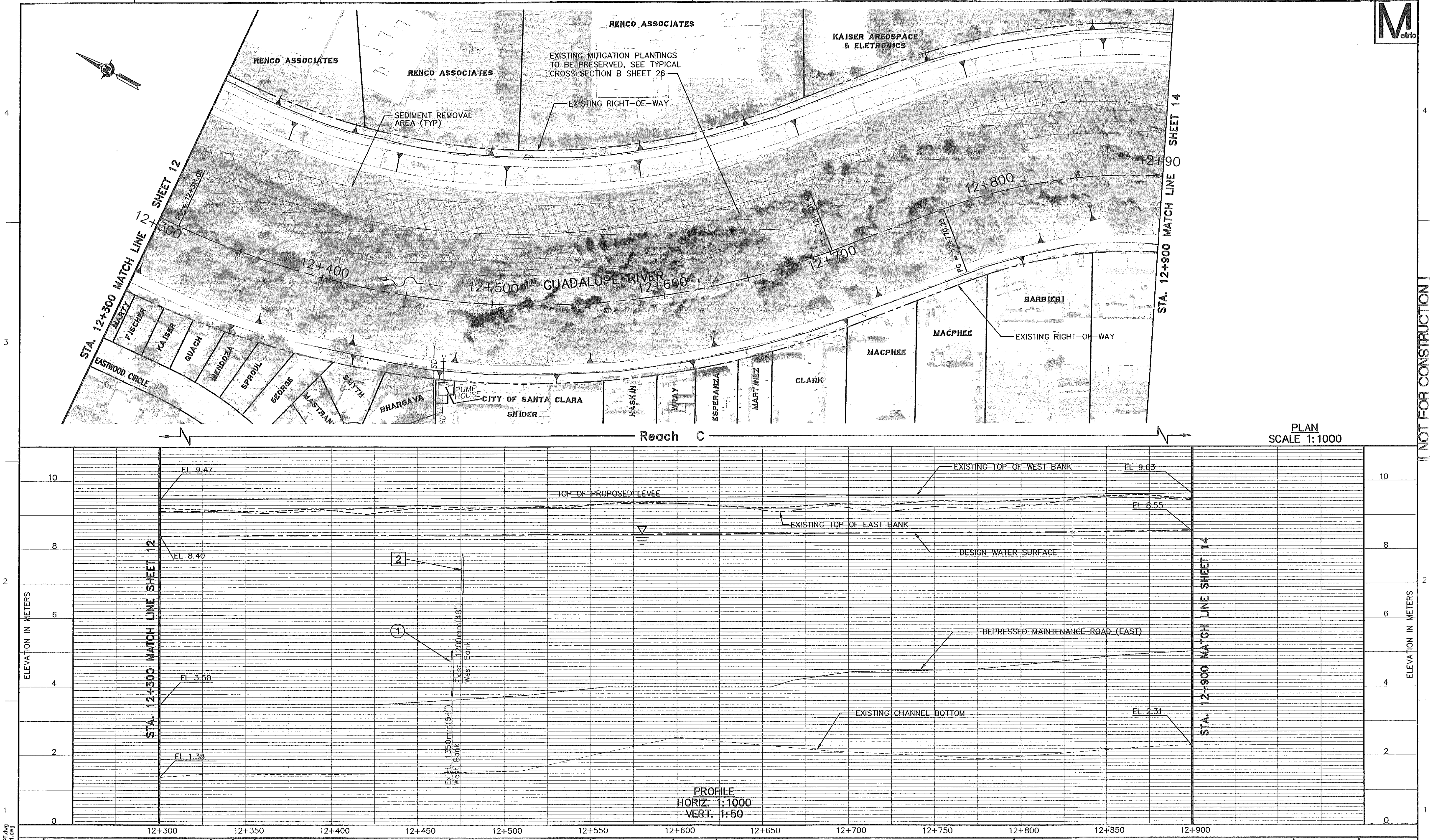
SCALE
H: 1:1000
V 1:50

SHEET
12
12 OF 45

Metric

[NOT FOR CONSTRUCTION]

PROJECT: 153735
DWG NAME:Acad\Rprt\S12-RPT.dwg
X-REF(S):Acad\Xrefs\SC-bdr1.dwg



| NOT FOR CONSTRUCTION |

PROJECT: 153735
DWG NAME:Acad\Rprt\S13-RPT.dwg
X-REF(S):Acad\Xrefs\SC-bdr1.dwg

REV	DESCRIPTION	DATE	APPR

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David Michael Von Rueden
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AUG. 2001
DESIGN
J.A.M.
DRAWN
J.A.M.
CHECKED
D.V.R.

Santa Clara Valley Water District

ACCEPTED BY DISTRICT

PROJECT ENGINEER

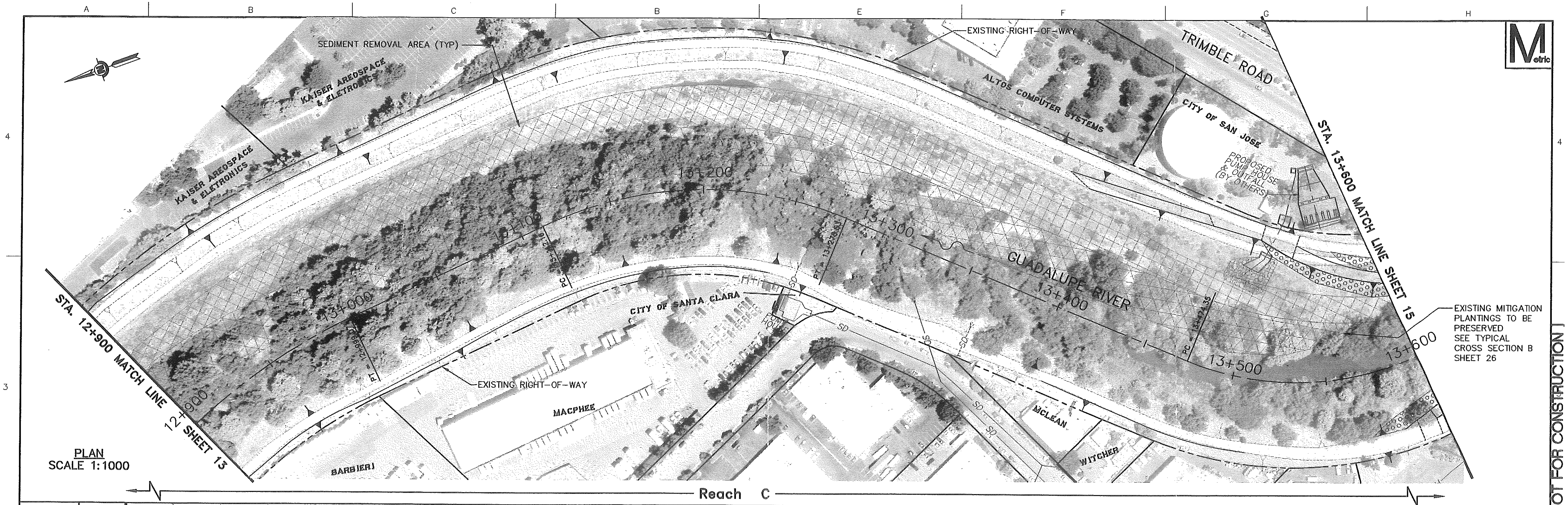
DATE

LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT
PLAN AND PROFILE
STA 12+300 TO STA 12+900

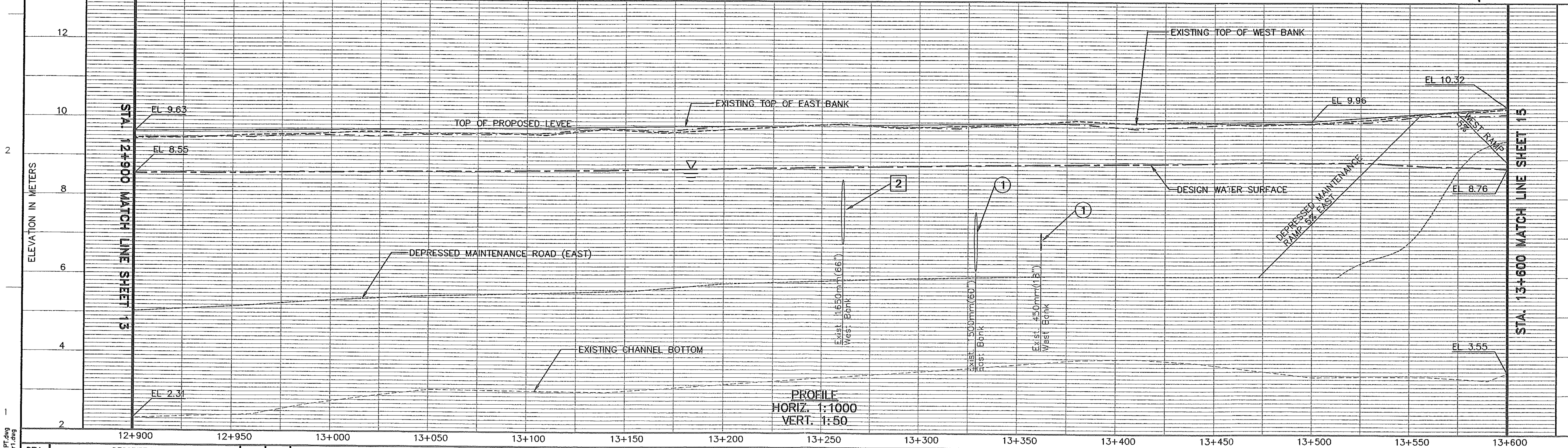
VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE
H: 1:1000
V 1:50

SHEET
13
13 OF 45


M etric
SEDIMENT REMOVAL AREA (TYP)
EXISTING RIGHT-OF-WAY
TRIMBLE ROAD
KAISER AREOSPACE & ELETRONICS
KAISER AREOSPACE & ELETRONICS
ALTOS COMPUTER SYSTEMS
CITY OF SAN JOSE
PROPOSED PUMP HOUSE & OUTFALL (BY OTHERS)
STA. 13+600 MATCH LINE SHEET 15
13+100
13+200
13+300
13+400
13+500
13+600
13+000
12+900
GUADALUPE RIVER
CITY OF SANTA CLARA
PUMP HOUSE
SD
EXISTING MITIGATION PLANTINGS TO BE PRESERVED SEE TYPICAL CROSS SECTION B SHEET 26
EXISTING RIGHT-OF-WAY
MACPHEE
MCLEAN
WITCHER
BARBIERI
STA. 12+900 MATCH LINE SHEET 13
Reach C

PLAN
SCALE 1:1000



PROFILE
HORIZ. 1:1000
VERT. 1:50

[NOT FOR CONSTRUCTION]

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES
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CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04

DATE AUG. 2001
DESIGN J.A.M.
DRAWN J.A.M.
CHECKED D.V.R.

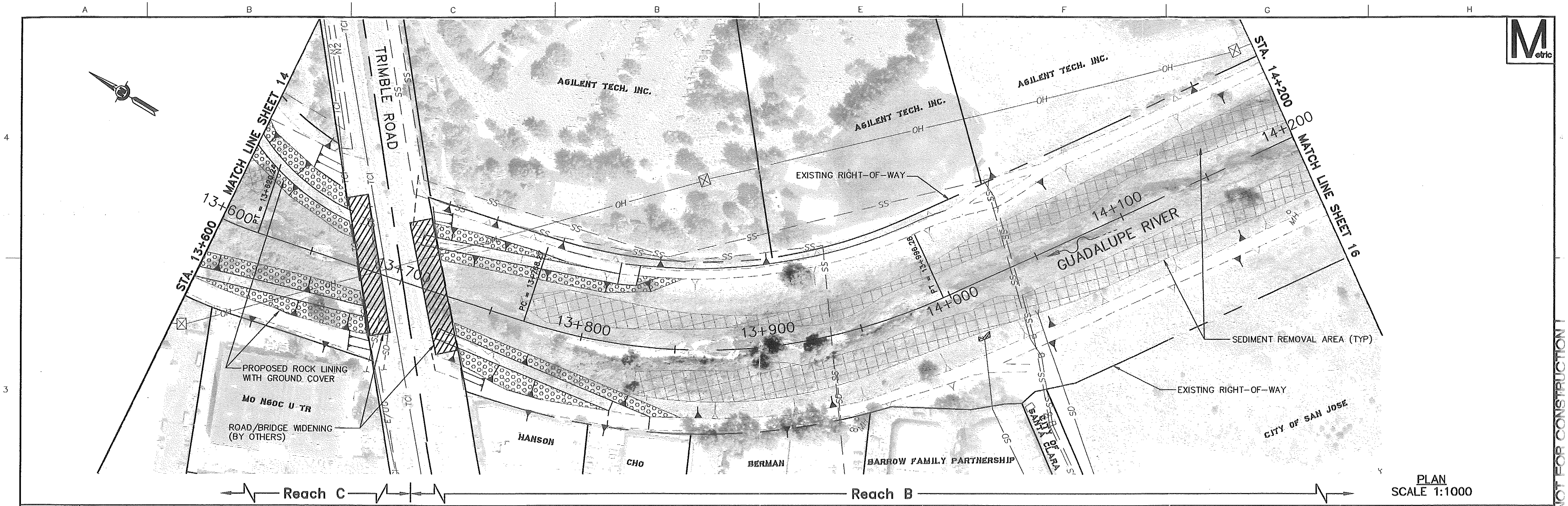
Santa Clara Valley Water District
ACCEPTED BY DISTRICT
DATE
PROJECT ENGINEER

LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT
PLAN AND PROFILE
STA 12+900 TO STA 13+600

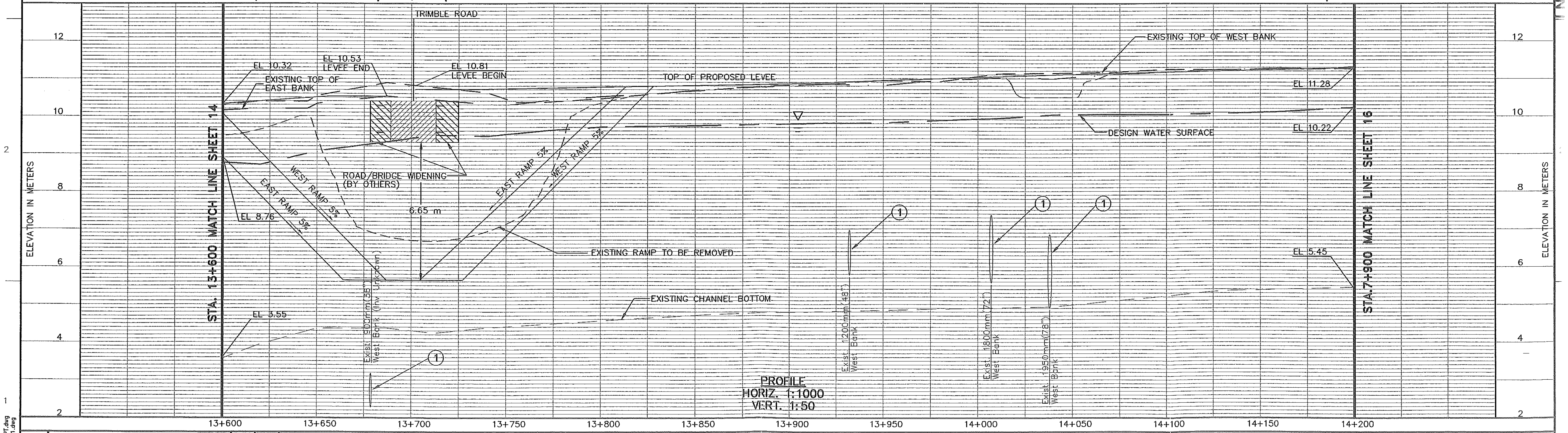
VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE
H: 1:1000
V 1:50
SHEET
14
14 OF 45

PROJECT: 153735
DWG NAME:Acad\Rprt\S14-RPT.dwg
X-REF(S):Acad\Xrefs\SC-bdr1.dwg



PLAN
SCALE 1:1000



PROFILE
HORIZ. 1:1000
VERT. 1:50

NOT FOR CONSTRUCTION

PROJECT: 153735
DWG NAME:Acad\Rpt\S15-RPT.dwg
X-REF(S):Acad\Xrefs\SC-bdr1.dwg

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

1. WATER SURFACE ELEV. Q DESIGN = 481.4 cms (17,000 cfs)
2. FLOODWALLS TO BE ARCHITECTURALLY TREATED.
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6. BRIDGE AND UTILITY INFORMATION TAKEN FROM RECORD DRAWINGS AND FROM AS-BUILTS.

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David Michael Von Rueden
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EXP. 03/31/04

DATE AUG. 2001
DESIGN J.A.M.
DRAWN J.A.M.
CHECKED D.V.R.

Santa Clara Valley Water District

ACCEPTED BY DISTRICT

DATE

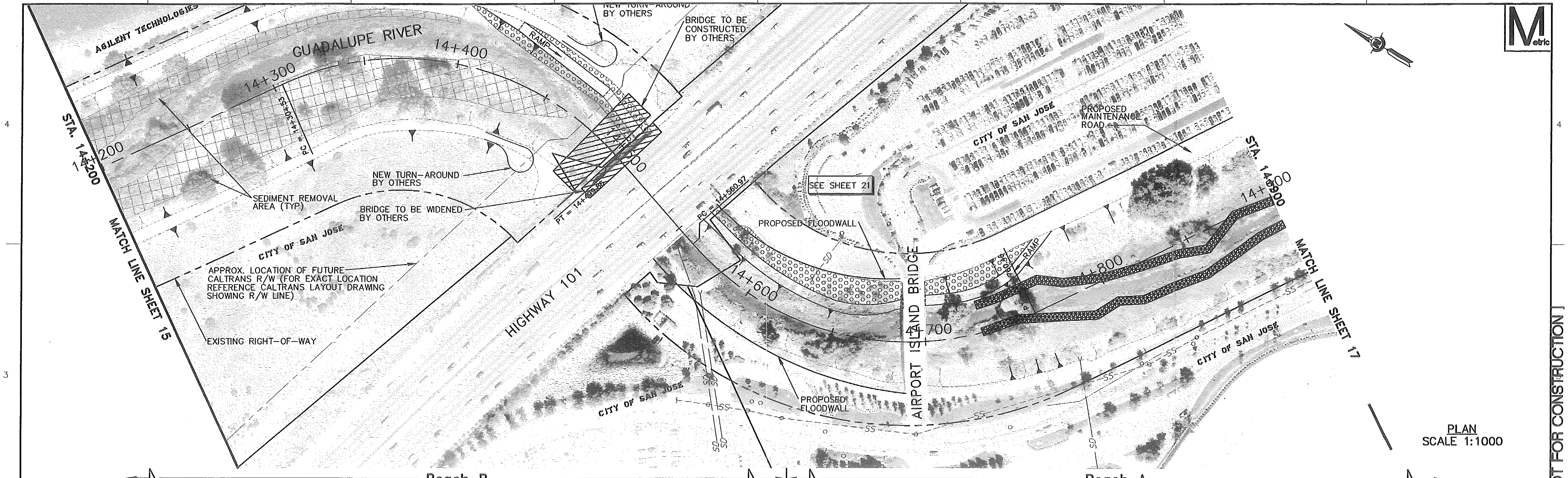
PROJECT ENGINEER

LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT
PLAN AND PROFILE
STA 13+600 TO STA 14+200

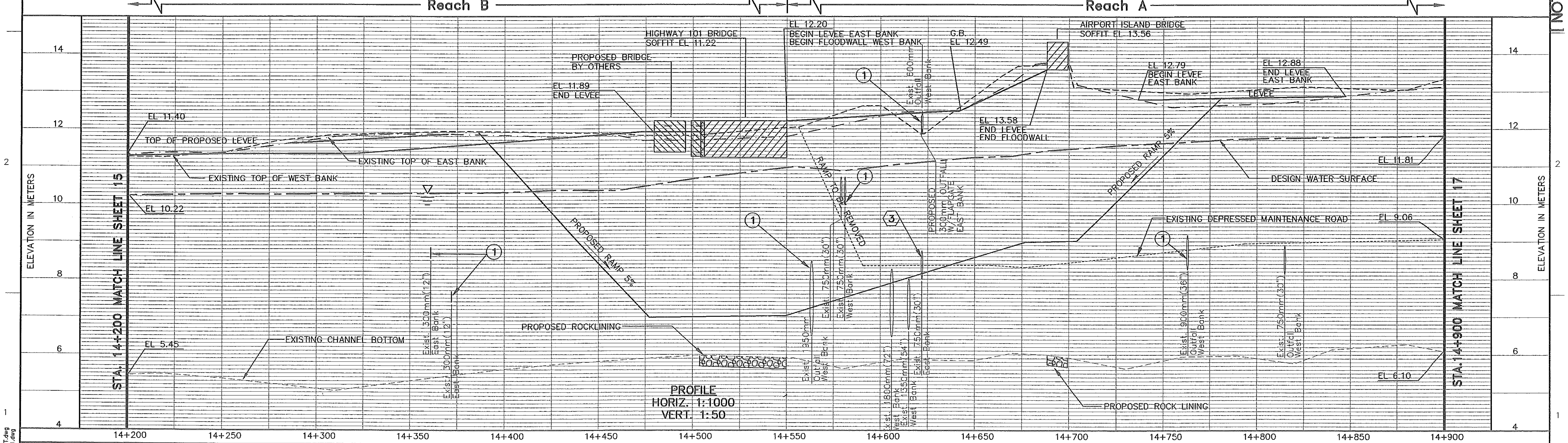
VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE
H: 1:1000
V 1:50

SHEET
15
15 OF 45



PLAN
SCALE 1:1000


Reach B
Reach A
ELEVATION IN METERS
14
12
10
8
6
4
STA. 14+200 MATCH LINE SHEET 15
STA. 14+900 MATCH LINE SHEET 17
HIGHWAY 101 BRIDGE SOFFIT EL 11.22
PROPOSED BRIDGE BY OTHERS
EL 11.89 END LEVEE
EL 12.20 BEGIN LEVEE EAST BANK BEGIN FLOODWALL WEST BANK
G.B. EL 12.49
AIRPORT ISLAND BRIDGE SOFFIT EL 13.56
EL 12.79 BEGIN LEVEE EAST BANK
EL 12.88 END LEVEE EAST BANK
LEVEE
EL 13.58 END LEVEE END FLOODWALL
EL 11.40
TOP OF PROPOSED LEVEE
EXISTING TOP OF EAST BANK
EXISTING TOP OF WEST BANK
EL 10.22
PROPOSED RAMP 5%
RAMP TO BE REMOVED
PROPOSED RAMP 5%
DESIGN WATER SURFACE
EL 11.81
EXISTING DEPRESSED MAINTENANCE ROAD
EL 9.06
Exist. 600mm Outfall West Bank
PROPOSED 300mm OUTFALL W/FLAPGATE EAST BANK
Exist. 300mm(12") East Bank
Exist. 300mm(12") East Bank
Exist. 950mm Outfall West Bank
Exist. 750mm(30") West Bank
Exist. 750mm(30") West Bank
Exist. 1800mm(72") West Bank
Exist. 1350mm(54") West Bank
Exist. 750mm(30") East Bank
Exist. 900mm(36") Outfall West Bank
Exist. 750mm(30") Outfall West Bank
①
③
PROPOSED ROCKLINING
EL 5.45
EXISTING CHANNEL BOTTOM
PROPOSED ROCK LINING
EL 6.10
14+200
14+250
14+300
14+350
14+400
14+450
14+500
14+550
14+600
14+650
14+700
14+750
14+800
14+850
14+900

PROFILE
HORIZ. 1:1000
VERT. 1:50

NOT FOR CONSTRUCTION

PROJECT: 153735
DWG NAME: Acad\Rprt\S16-RPT.dwg
X-REF(S): Acad\Xrefs\SC-bdr1.dwg

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

1. WATER SURFACE ELEV. Q DESIGN = 481.4 cms (17,000 cfs)
2. FLOODWALLS TO BE ARCHITECTURALLY TREATED
3. RIGHT-OF-WAY & PROPERTY LINES DERIVED FROM SANTA CLARA VALLEY WATER DISTRICT (SCVWD), RIGHT-OF-WAY DRAWINGS & PARCEL MAPS
4. STORM DRAIN AND PUMP STATION OUTFALLS SHOWN ON PROFILE
5. AERIAL PHOTOS TAKEN 08/20/1999, 72/in
6. BRIDGE AND UTILITY INFORMATION TAKEN FROM RECORD DRAWINGS AND FROM AS-BUILTS

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04

DATE	AUG. 2001
DESIGN	J.A.M.
DRAWN	J.A.M.
CHECKED	D.V.R.

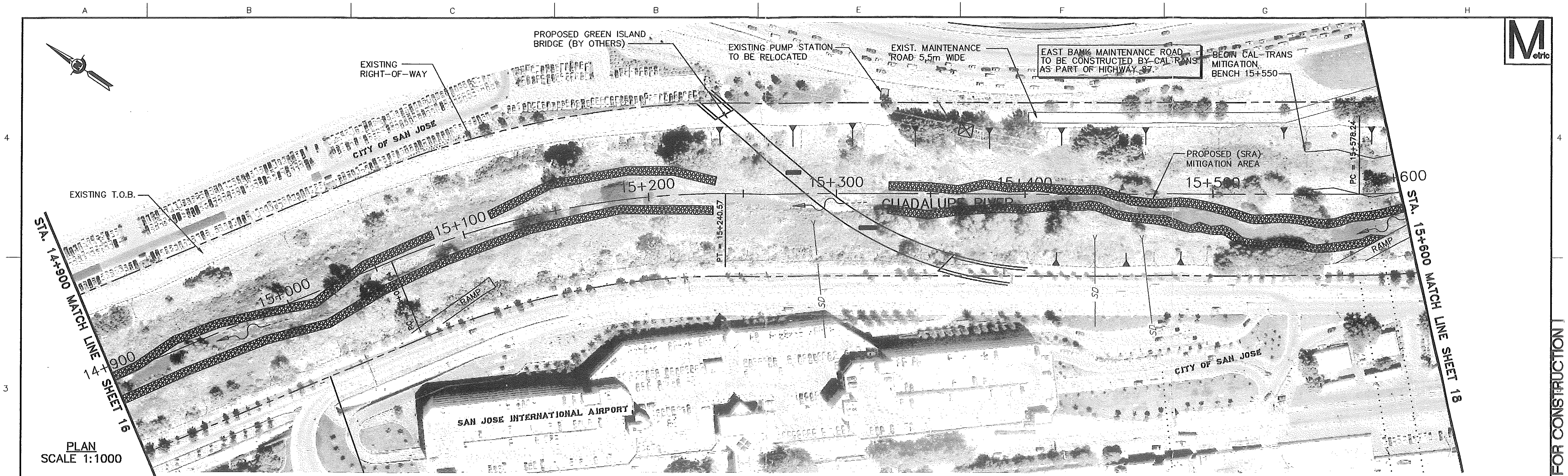
Santa Clara Valley Water District
ACCEPTED BY DISTRICT
DATE
PROJECT ENGINEER

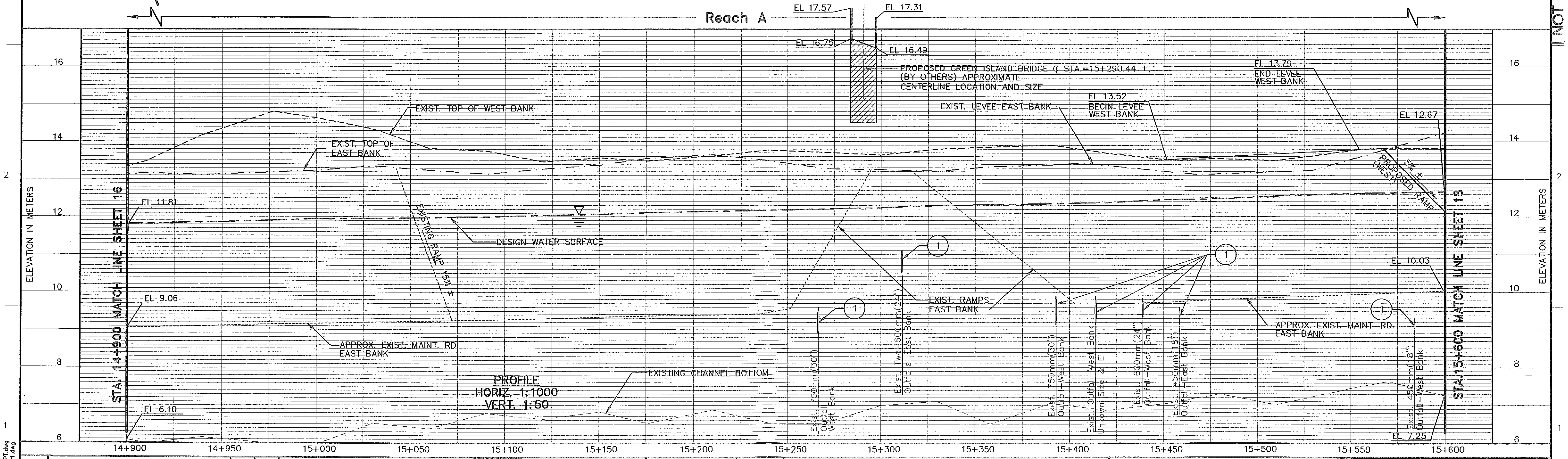
LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT
PLAN AND PROFILE
STA 14+200 TO STA 14+900

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE
H: 1:1000
V 1:50

SHEET
16
16 OF 45


Metric
PROPOSED GREEN ISLAND BRIDGE (BY OTHERS)
EXISTING PUMP STATION TO BE RELOCATED
EXIST. MAINTENANCE ROAD 5.5m WIDE
EAST BANK MAINTENANCE ROAD TO BE CONSTRUCTED BY CAL-TRANS AS PART OF HIGHWAY 87
BEGIN CAL-TRANS MITIGATION BENCH 15+550
EXISTING RIGHT-OF-WAY
CITY OF SAN JOSE
PROPOSED (SRA) MITIGATION AREA
PC = 15+578.24
EXISTING T.O.B.
15+200
15+300
15+400
15+500
15+600
GUADALUPE RIVER
PT = 15+240.57
15+100
15+000
14+900
RAMP
RAMP
SD
SD
SD
CITY OF SAN JOSE
SAN JOSE INTERNATIONAL AIRPORT
STA. 14+900 MATCH LINE SHEET 16
STA. 15+600 MATCH LINE SHEET 18
PLAN
SCALE 1:1000


Reach A
EL 17.57
EL 17.31
EL 16.75
EL 16.49
PROPOSED GREEN ISLAND BRIDGE ℄ STA.=15+290.44 ±, (BY OTHERS) APPROXIMATE CENTERLINE LOCATION AND SIZE
EXIST. TOP OF WEST BANK
EXIST. TOP OF EAST BANK
EXIST. LEVEE EAST BANK
EL 13.52
BEGIN LEVEE WEST BANK
EL 13.79
END LEVEE WEST BANK
EL 12.67
PROPOSED RAMP (WEST) 5% ±
EL 11.81
EXISTING RAMP 15% ±
DESIGN WATER SURFACE
EXIST. RAMPS EAST BANK
EL 10.03
EL 9.06
APPROX. EXIST. MAINT. RD. EAST BANK
APPROX. EXIST. MAINT. RD. EAST BANK
EXISTING CHANNEL BOTTOM
PROFILE
HORIZ. 1:1000
VERT. 1:50
EL 6.10
EL 7.25
1
Exist. 750mm(30") Outfall West Bank
Exist. Two-600mm(24") Outfalls-East Bank
Exist. 750mm(30") Outfall-West Bank
Exist. Outfall-West Bank Unkown Size & El
Exist. 600mm(24") Outfall-West Bank
Exist. 450mm(18") Outfall-East Bank
Exist. 450mm(18") Outfall-West Bank
ELEVATION IN METERS
16
14
12
10
8
6
STA. 14+900 MATCH LINE SHEET 16
STA. 15+600 MATCH LINE SHEET 18
14+900
14+950
15+000
15+050
15+100
15+150
15+200
15+250
15+300
15+350
15+400
15+450
15+500
15+550
15+600

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	APPR

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PROJECT: 153735
DWG NAME: Acad\Rprt\S17-RPT.dwg
X-REF(S): Acad\Xrefs\SC-bdr1.dwg

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

REGISTERED PROFESSIONAL ENGINEER
David Michael Von Rueden
RCE 26428
EXP. 03/31/04
CIVIL
STATE OF CALIFORNIA

DATE AUG. 2001
DESIGN J.A.M.
DRAWN J.A.M.
CHECKED D.V.R.

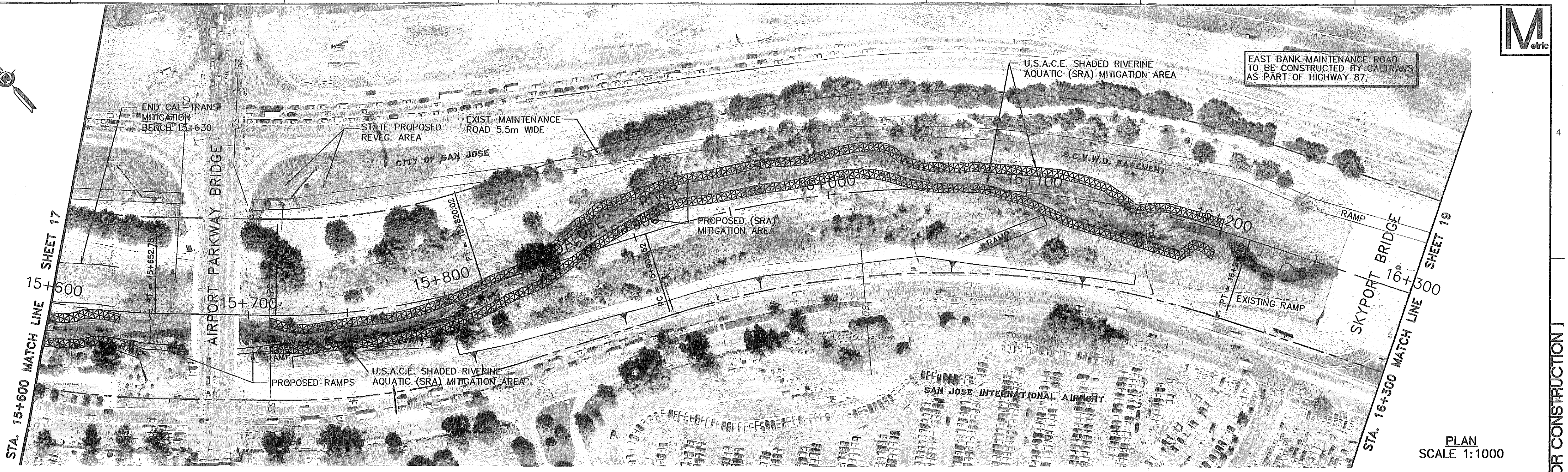
Santa Clara Valley Water District
ACCEPTED BY DISTRICT
DATE
PROJECT ENGINEER

LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT
PLAN AND PROFILE
STA 14+900 TO STA 15+600

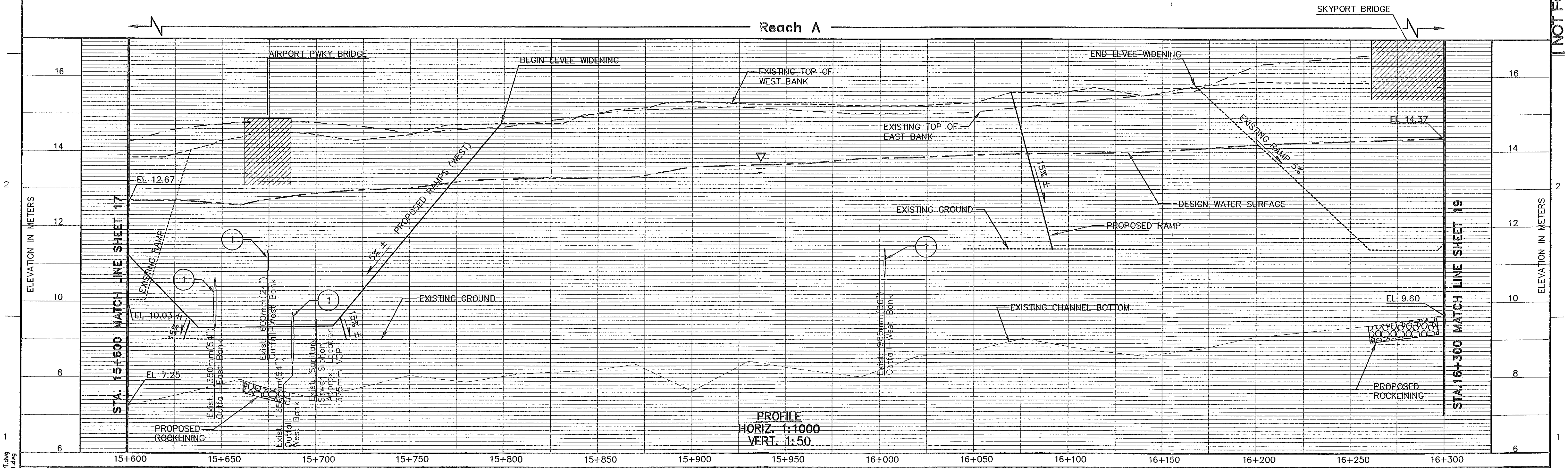
VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE
H: 1:1000
V 1:50

SHEET
17
17 OF 45



EAST BANK MAINTENANCE ROAD TO BE CONSTRUCTED BY CALTRANS AS PART OF HIGHWAY 87.
U.S.A.C.E. SHADED RIVERINE AQUATIC (SRA) MITIGATION AREA
END CALTRANS MITIGATION BENCH 15+630
STATE PROPOSED REVEG. AREA
EXIST. MAINTENANCE ROAD 5.5m WIDE
CITY OF SAN JOSE
S.C.V.W.D. EASEMENT
AIRPORT PARKWAY BRIDGE
GUADALUPE RIVER
PROPOSED (SRA) MITIGATION AREA
RAMP
EXISTING RAMP
SKYPORT BRIDGE
PROPOSED RAMPS
U.S.A.C.E. SHADED RIVERINE AQUATIC (SRA) MITIGATION AREA
SAN JOSE INTERNATIONAL AIRPORT
STA. 15+600 MATCH LINE SHEET 17
STA. 16+300 MATCH LINE SHEET 19
15+600
15+700
15+800
16+000
16+100
16+200
16+300
PT = 15+652.78
PT = 15+820.02
PC = 15+909.52
PLAN
SCALE 1:1000



[NOT FOR CONSTRUCTION]

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4. STORM DRAIN AND PUMP STATION OUTFALLS SHOWN ON PROFILE.
5. AERIAL PHOTOS TAKEN 08/20/1999, 72/in.
6. BRIDGE AND UTILITY INFORMATION TAKEN FROM RECORD DRAWINGS AND FROM AS-BUILTS.

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04

DATE AUG. 2001
DESIGN J.A.M.
DRAWN J.A.M.
CHECKED D.V.R.

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
PROJECT ENGINEER
DATE

LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT
PLAN AND PROFILE
STA 15+600 TO STA 16+300

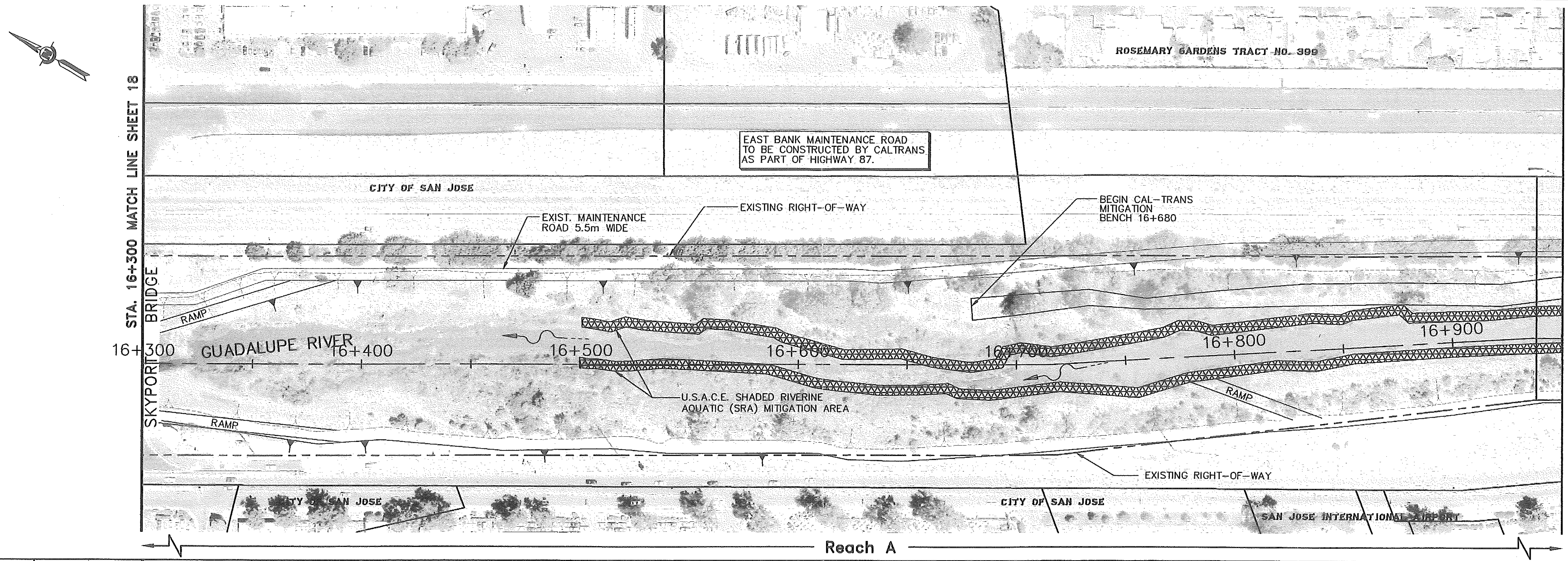
VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE
H 1:1000
V 1:50

SHEET
18
18 OF 45

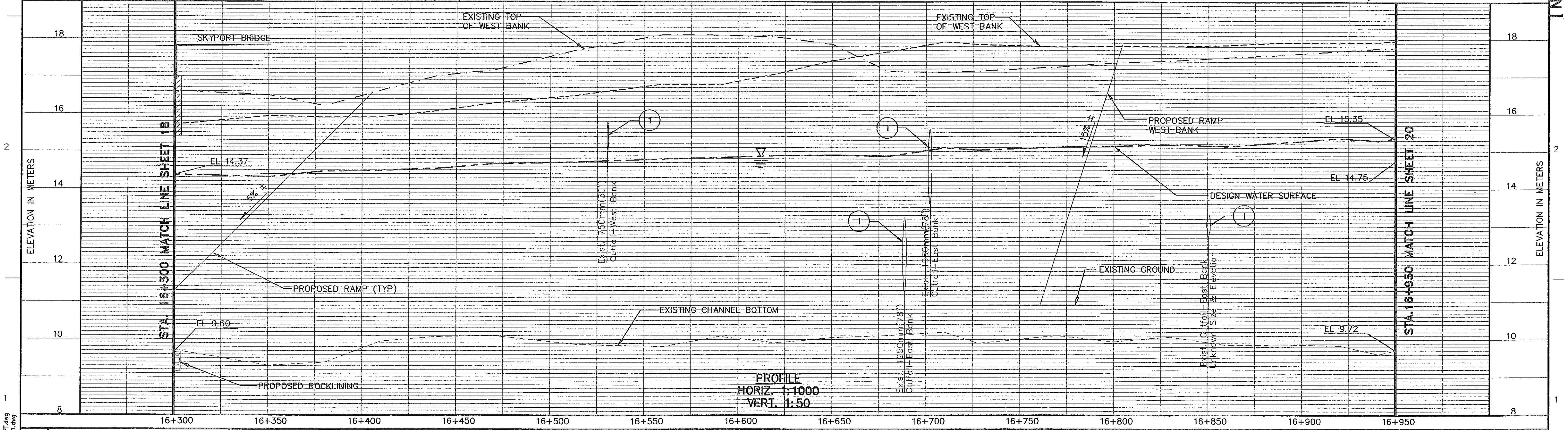
PROJECT: 153735
DWG NAME:Acad\Rpt\S18-RPT.dwg
X-REF(S):Acad\Xrefs\SC-bdr1.dwg

Metric


ROSEMARY GARDENS TRACT NO. 399
STA. 16+300 MATCH LINE SHEET 18
STA. 16+950 MATCH LINE SHEET 20
EAST BANK MAINTENANCE ROAD TO BE CONSTRUCTED BY CALTRANS AS PART OF HIGHWAY 87.
CITY OF SAN JOSE
EXIST. MAINTENANCE ROAD 5.5m WIDE
EXISTING RIGHT-OF-WAY
BEGIN CAL-TRANS MITIGATION BENCH 16+680
SKYPORT BRIDGE
RAMP
GUADALUPE RIVER
16+300
16+400
16+500
16+600
16+700
16+800
16+900
U.S.A.C.E. SHADED RIVERINE AQUATIC (SRA) MITIGATION AREA
RAMP
RAMP
EXISTING RIGHT-OF-WAY
CITY OF SAN JOSE
CITY OF SAN JOSE
SAN JOSE INTERNATIONAL AIRPORT
Reach A

PLAN
SCALE 1:1000

[NOT FOR CONSTRUCTION]



PROFILE
HORIZ. 1:1000
VERT. 1:50

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES
1. WATER SURFACE ELEV. Q DESIGN = 481.4 cms (17,000 cfs)
2. FLOODWALLS TO BE ARCHITECTURALLY TREATED.
3. RIGHT-OF-WAY AND PROPERTY LINES DERIVED FROM SANTA CLARA VALLEY WATER DISTRICT (SCVWD), RIGHT-OF-WAY DRAWINGS AND PARCEL MAPS.
4. STORM DRAIN AND PUMP STATION OUTFALLS SHOWN ON PROFILE.
5. AERIAL PHOTOS TAKEN 08/20/1999, 72/in.
6. BRIDGE AND UTILITY INFORMATION TAKEN FROM RECORD DRAWINGS AND FROM AS-BUILTS.

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04

DATE AUG. 2001
DESIGN J.A.M.
DRAWN J.A.M.
CHECKED D.V.R.

Santa Clara Valley Water District

ACCEPTED BY DISTRICT

PROJECT ENGINEER

DATE

LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT

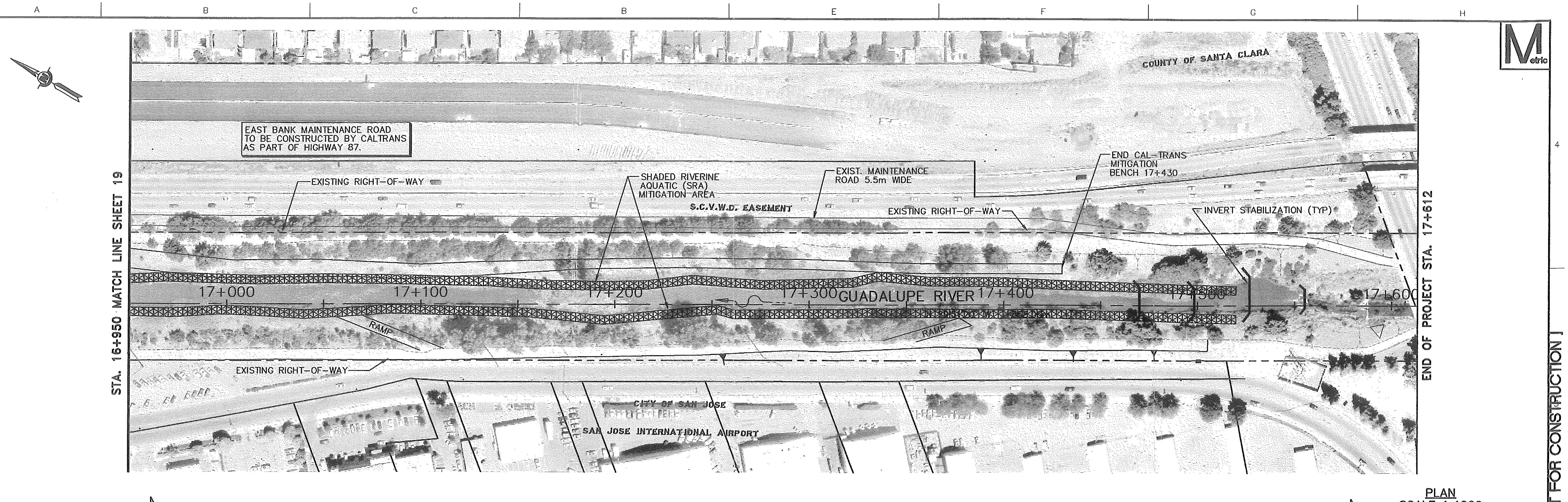
PLAN AND PROFILE
STA 16+300 TO STA 16+950

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

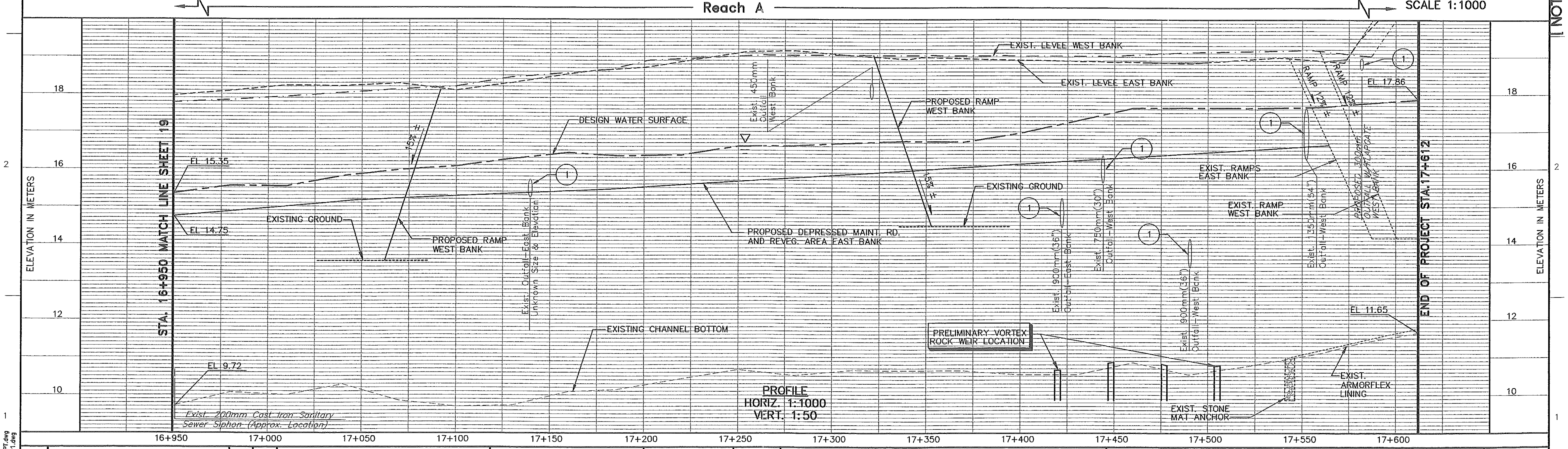
SCALE
H 1:1000
V 1:50

SHEET
19
19 OF 45

PROJECT: 153735
DWG NAME:Acad\Rprt\S19-RPT.dwg
X-REF(S):Acad\Xrefs\SC-bdr1.dwg



Metric
COUNTY OF SANTA CLARA
EAST BANK MAINTENANCE ROAD TO BE CONSTRUCTED BY CALTRANS AS PART OF HIGHWAY 87.
EXISTING RIGHT-OF-WAY
SHADED RIVERINE AQUATIC (SRA) MITIGATION AREA
EXIST. MAINTENANCE ROAD 5.5m WIDE
END CAL-TRANS MITIGATION BENCH 17+430
S.C.V.W.D. EASEMENT
EXISTING RIGHT-OF-WAY
INVERT STABILIZATION (TYP)
STA. 16+950 MATCH LINE SHEET 19
17+000
17+100
17+200
17+300
GUADALUPE RIVER
17+400
17+500
17+600
END OF PROJECT STA. 17+612
RAMP
RAMP
EXISTING RIGHT-OF-WAY
CITY OF SAN JOSE
SAN JOSE INTERNATIONAL AIRPORT
PLAN
SCALE 1:1000



Reach A
EXIST. LEVEE WEST BANK
EXIST. LEVEE EAST BANK
EL 17.86
RAMP 12%
RAMP 12%
Exist. 450mm Outfall West Bank
PROPOSED RAMP WEST BANK
DESIGN WATER SURFACE
15%
15%
EL 15.35
EL 14.75
EXISTING GROUND
PROPOSED RAMP WEST BANK
EXISTING GROUND
PROPOSED DEPRESSED MAINT. RD. AND REVEG. AREA EAST BANK
EXIST. RAMPS EAST BANK
EXIST. RAMP WEST BANK
Exist. Outfall-East Bank Unknown Size & Elevation
Exist. 900mm(36") Outfall-East Bank
Exist. 750mm(30") Outfall-West Bank
Exist. 900mm(36") Outfall-West Bank
Exist. 1350mm(54") Outfall-West Bank
PROPOSED 300mm OUTFALL W/ FLAPGATE WEST BANK
①
STA. 16+950 MATCH LINE SHEET 19
END OF PROJECT STA.17+612
EXISTING CHANNEL BOTTOM
EL 9.72
EL 11.65
PRELIMINARY VORTEX ROCK WEIR LOCATION
EXIST. ARMORFLEX LINING
EXIST. STONE MAT ANCHOR
Exist. 200mm Cast Iron Sanitary Sewer Siphon (Approx. Location)
ELEVATION IN METERS
10
12
14
16
18
16+950
17+000
17+050
17+100
17+150
17+200
17+250
17+300
17+350
17+400
17+450
17+500
17+550
17+600
PROFILE
HORIZ. 1:1000
VERT. 1:50

[NOT FOR CONSTRUCTION]

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

1. WATER SURFACE ELEV. Q DESIGN = 481.4 cms (17,000 cfs)
2. FLOODWALLS TO BE ARCHITECTURALLY TREATED.
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4. STORM DRAIN AND PUMP STATION OUTFALLS SHOWN ON PROFILE.
5. AERIAL PHOTOS TAKEN 08/20/1999, 72/in.
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CH2MHILL

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SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04

DATE AUG. 2001
DESIGN J.A.M.
DRAWN J.A.M.
CHECKED D.V.R.

Santa Clara Valley Water District

ACCEPTED BY DISTRICT

PROJECT ENGINEER

DATE

LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT

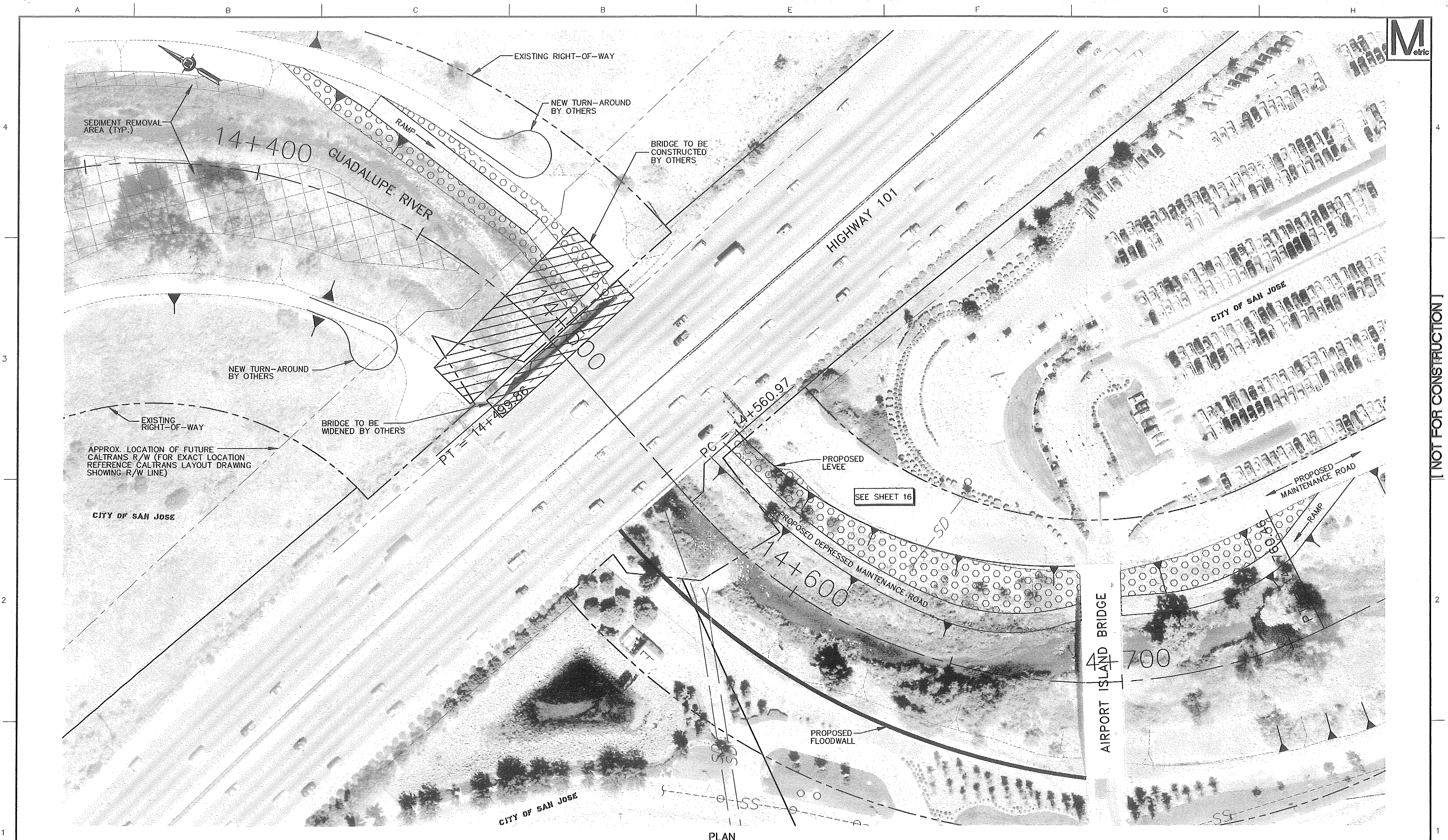
PLAN AND PROFILE
STAT 16+950 TO STA 17+550

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE
H 1:1000
V 1:50

SHEET
20
20 OF 45

PROJECT: 153735
DWG NAME: Acad\Rpt\S20-RPT.dwg
X-REF(S): Acad\Xrefs\SC-bdr1.dwg


A
B
C
D
E
F
G
H
4
3
2
1
Metric
EXISTING RIGHT-OF-WAY
NEW TURN-AROUND BY OTHERS
SEDIMENT REMOVAL AREA (TYP.)
14+400 GUADALUPE RIVER
RAMP
BRIDGE TO BE CONSTRUCTED BY OTHERS
HIGHWAY 101
14+500
NEW TURN-AROUND BY OTHERS
EXISTING RIGHT-OF-WAY
BRIDGE TO BE WIDENED BY OTHERS
PT = 14+499.86
PC = 14+560.97
APPROX. LOCATION OF FUTURE CALTRANS R/W (FOR EXACT LOCATION REFERENCE CALTRANS LAYOUT DRAWING SHOWING R/W LINE)
CITY OF SAN JOSE
CITY OF SAN JOSE
PROPOSED LEVEE
SEE SHEET 16
PROPOSED MAINTENANCE ROAD
RAMP
SD
PROPOSED DEPRESSED MAINTENANCE ROAD
14+600
PT = 14+760.46
AIRPORT ISLAND BRIDGE
14+700
PROPOSED FLOODWALL
SD
SD
SS
SS
CITY OF SAN JOSE
[NOT FOR CONSTRUCTION]

PLAN
SCALE 1:500

PROJECT: 153735
DWG NAME: Acad\Rprt\S21-RPT.dwg
X-REF(S): Acad\Xrefs\SC-bdr2.dwg

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

1. WATER SURFACE ELEV. Q DESIGN = 481.4 cms (17,000 cfs)
2. FLOODWALLS TO BE ARCHITECTURALLY TREATED
3. RIGHT-OF-WAY & PROPERTY LINES DERIVED FROM SANTA CLARA VALLEY WATER DISTRICT (SCVWD), RIGHT-OF-WAY DRAWINGS & PARCEL MAPS
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CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04

DATE
AUG. 2001
DESIGN
J.A.M.
DRAWN
J.A.M.
CHECKED
D.V.R.

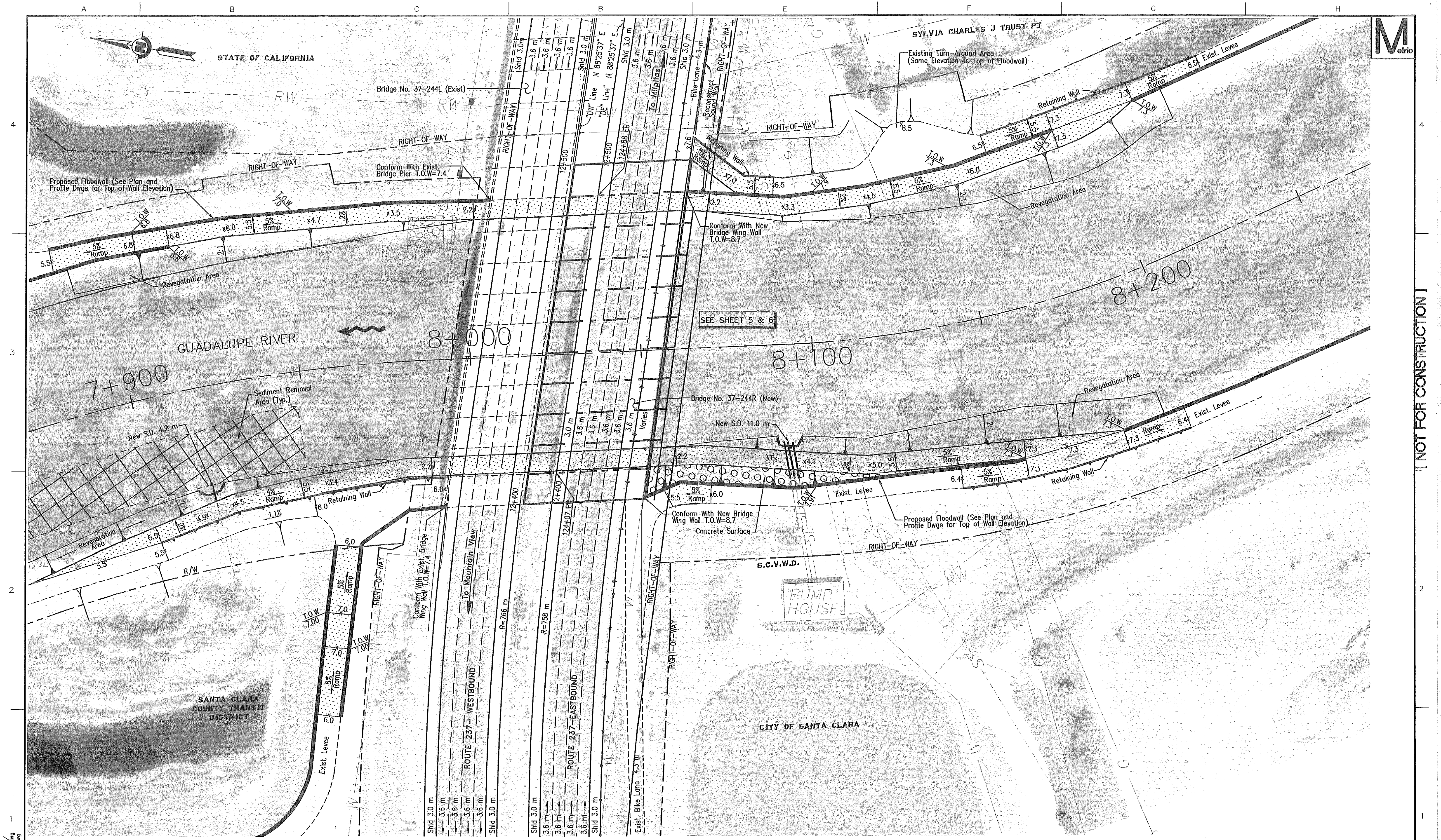
Santa Clara Valley Water District
ACCEPTED BY DISTRICT
DATE
PROJECT ENGINEER

LOWER GUADALUPE RIVER
FLOOD PROTECTION PROJECT
PLAN VIEW
HIGHWAY 101

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE
H: 1:500

SHEET
21
21 OF 45



PROJECT: 153735/Acad/Rprt/237/
DWG NAME:Acad\Rprt\S22-RPT.dwg
X-REF(S):Acad\Xrefs\SC-bdr2.dwg

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

1. WATER SURFACE ELEV. Q DESIGN = 481.4 cms (17,000 cfs)
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4. STORM DRAIN AND PUMP STATION OUTFALLS SHOWN ON PROFILE.
5. AERIAL PHOTOS TAKEN 08/20/1999, 72/in.
6. BRIDGE AND UTILITY INFORMATION TAKEN FROM RECORD DRAWINGS AND FROM AS-BUILTS.

CH2MHILL

1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04

DATE
AUG. 2001
DESIGN
DRAWN
J.A.K.
CHECKED

Santa Clara Valley Water District

ACCEPTED BY DISTRICT

PROJECT ENGINEER

DATE

LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT

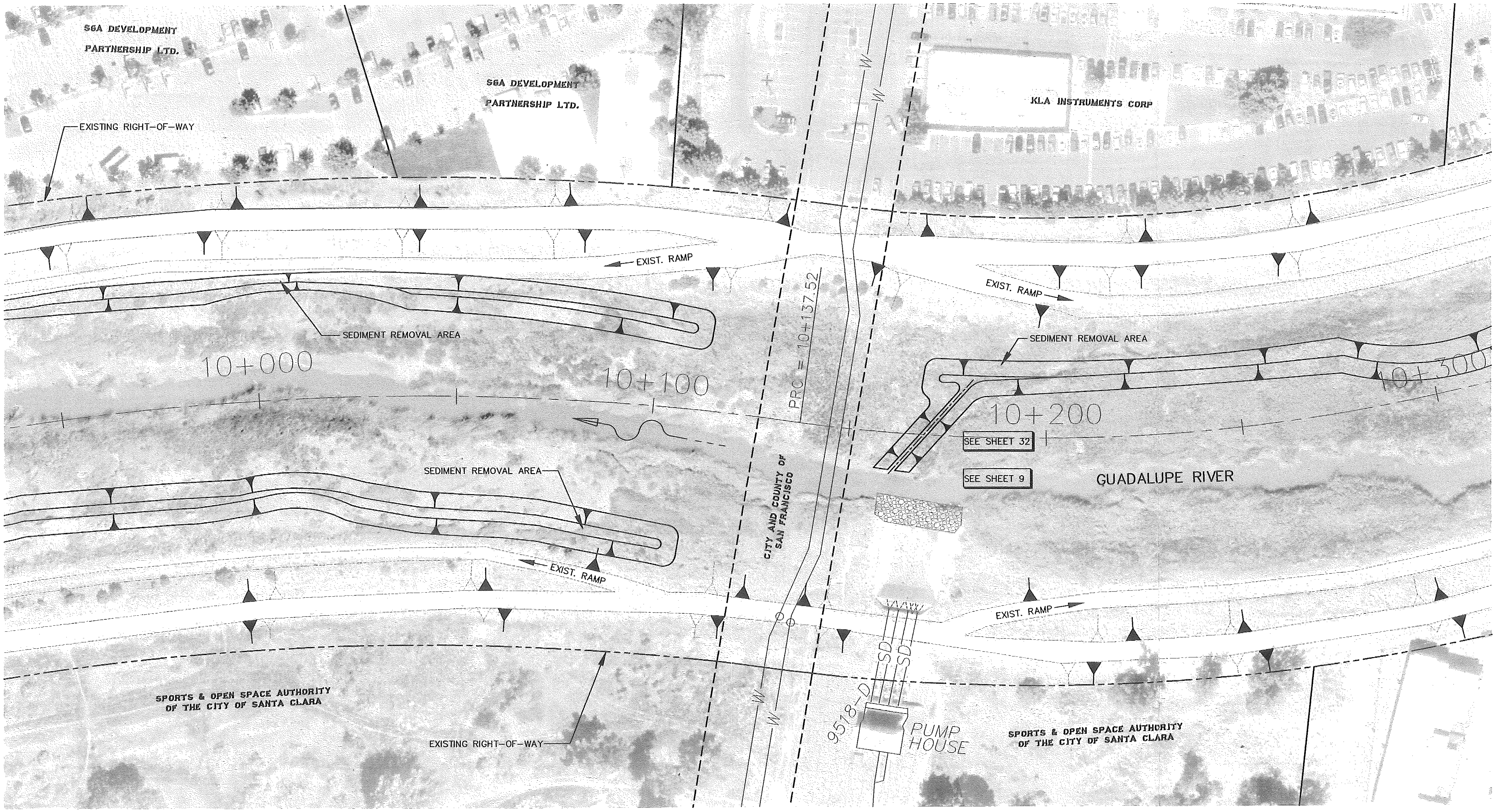
PLAN VIEW
ROUTE 237

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE
H: 1:500

SHEET
22
22 OF 45

Metric



PLAN SCALE
SCALE 1:500

[NOT FOR CONSTRUCTION]

PROJECT: 153735
DWG NAME: Acad\Rprt\S23-RPT.dwg
X-REF(S): Acad\Xrefs\SC-bdr1.dwg

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES
1. WATER SURFACE ELEV. Q DESIGN = 481.4 cms (17,000 cfs)
2. FLOODWALLS TO BE ARCHITECTURALLY TREATED.
3. RIGHT-OF-WAY AND PROPERTY LINES DERIVED FROM SANTA CLARA VALLEY WATER DISTRICT (SCVWD), RIGHT-OF-WAY DRAWINGS AND PARCEL MAPS.
4. STORM DRAIN AND PUMP STATION OUTFALLS SHOWN ON PROFILE.
5. AERIAL PHOTOS TAKEN 08/20/1999, 72/in.
6. BRIDGE AND UTILITY INFORMATION TAKEN FROM RECORD DRAWINGS AND FROM AS-BUILTS.

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

REGISTERED PROFESSIONAL ENGINEER
David Michael Von Rueden
RCE 26428
EXP. 03/31/04
CIVIL
STATE OF CALIFORNIA

DATE AUG. 2001
DESIGN J.A.M.
DRAWN J.A.M.
CHECKED D.V.R.

Santa Clara Valley Water District

ACCEPTED BY DISTRICT

DATE

PROJECT ENGINEER

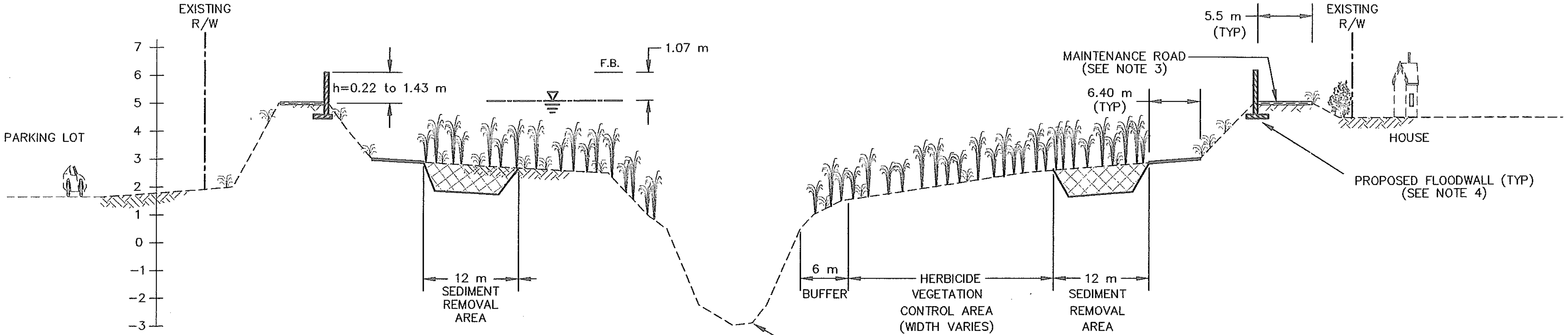
LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT
PLAN VIEW
HETCH HETCHY WATER PIPELINE

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

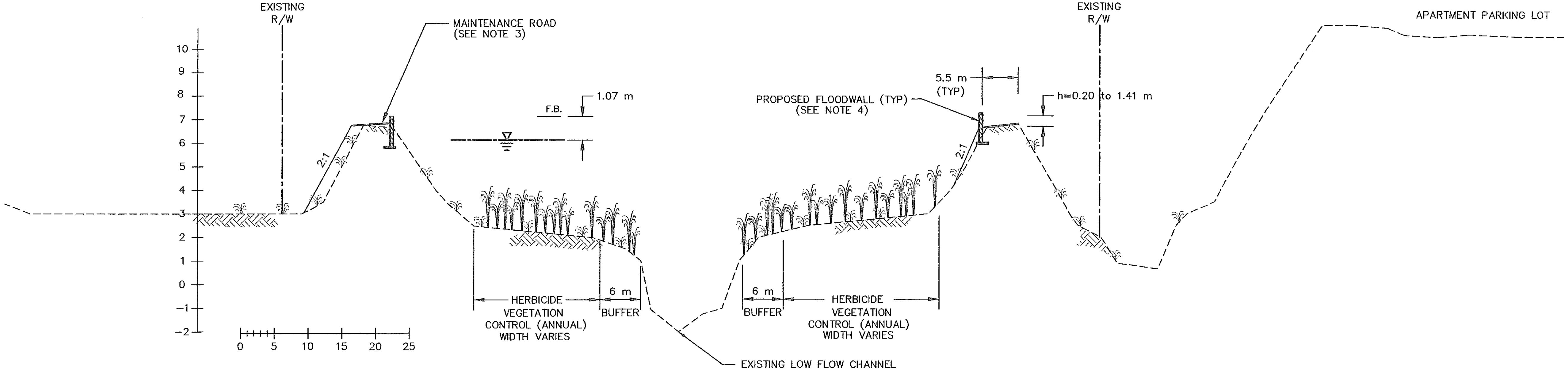
SCALE
H: 1:500

SHEET
23
23 OF 45

Metric



(A/–) STA 7+008 TO STA 7+995
U.P.R.R. TO ROUTE 237
REACH G
NTS


EXISTING R/W
MAINTENANCE ROAD (SEE NOTE 3)
10
9
8
7
6
5
4
3
2
1
0
−1
−2
2:1
F.B.
1.07 m
0
5
10
15
20
25
HERBICIDE VEGETATION CONTROL (ANNUAL) WIDTH VARIES
6 m
BUFFER
EXISTING LOW FLOW CHANNEL
6 m
BUFFER
HERBICIDE VEGETATION CONTROL (ANNUAL) WIDTH VARIES
PROPOSED FLOODWALL (TYP) (SEE NOTE 4)
5.5 m (TYP)
2:1
h=0.20 to 1.41 m
EXISTING R/W
APARTMENT PARKING LOT

(B/–) STA 8+055 TO STA 8+750 ±
ROUTE 237 TO STA 8+750
REACH F
NTS

▽ DESIGN WATER SURFACE

[NOT FOR CONSTRUCTION]

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES
1. SECTION CUT LOOKING UPSTREAM
2. Q DESIGN = 481.4 cms (17,000 cfs)
3. MAINTENANCE ROAD PAVING – 152 mm (6") MIN. WIDTH 5.5 m.
4. ALL EXISTING LEVEES WILL BE STABILITY TESTED
5. FLOODWALLS WILL BE ARCHITECTURALLY TREATED.

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112–4524
(408)436–4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04

DATE AUG. 2001
DESIGN JAM
DRAWN JAM
CHECKED EG

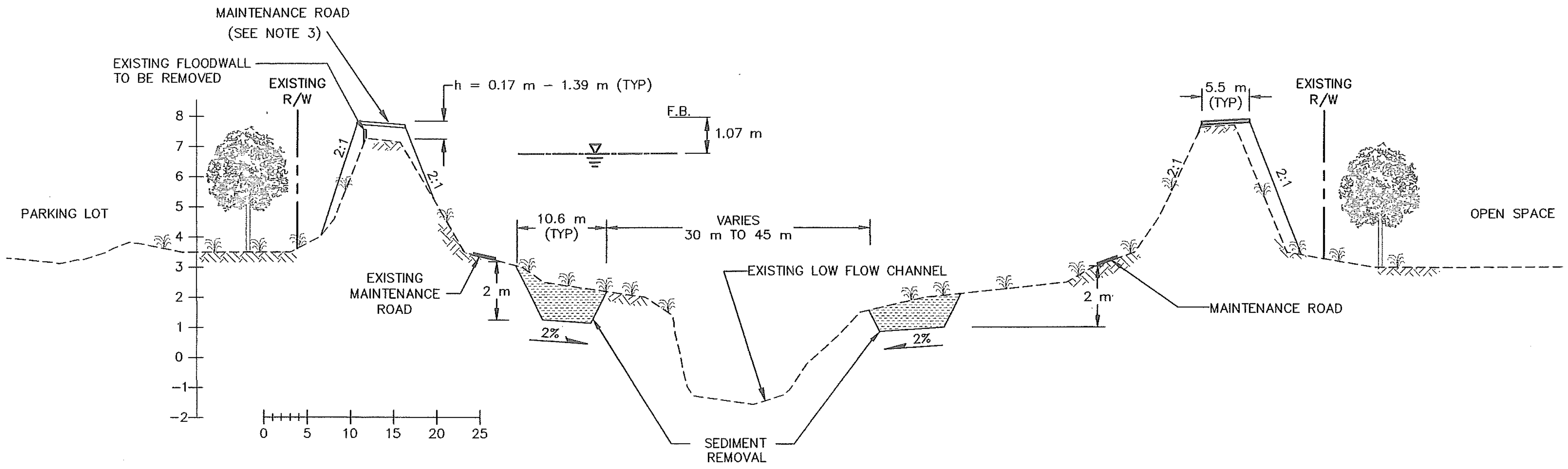
Santa Clara Valley Water District
ACCEPTED BY DISTRICT
DATE
PROJECT ENGINEER

LOWER GUADALUPE RIVER
FLOOD PROTECTION PROJECT
STA. 7+008 TO STA. 7+995
STA 8+055 TO STA 8+750
TYPICAL SECTIONS

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE N.T.S.
SHEET 24
24 OF 45

PROJECT: 153735
DWG NAME: Acad\Rpt\S24–RPT.dwg
X–REF(S): Acad\Xrefs\SC–bdr1.dwg



(A/–) STA 9+245 TO STA 10+127 ±
TASMAN DRIVE TO HETCH-HETCHY PIPELINE
REACH E
NTS

[NOT FOR CONSTRUCTION]

DESIGN WATER SURFACE

PROJECT: 153735
DWG NAME:Acad\Rprt\S25–RPT.dwg
X–REF(S):Acad\Xrefs\SC–bdr1.dwg

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES
1. SECTION CUT LOOKING UPSTREAM
2. Q DESIGN = 481.4 cms (17,000 cfs)
3. MAINTENANCE ROAD PAVING – 152 mm (6") MIN. WIDTH 5.5 m.
4. ALL EXISTING LEVEES WILL BE STABILITY TESTED
5. FLOODWALLS WILL BE ARCHITECTURALLY TREATED.

CH2MHILL
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DATE AUG. 2001
DESIGN JAM
DRAWN JAM
CHECKED EG

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
DATE
PROJECT ENGINEER

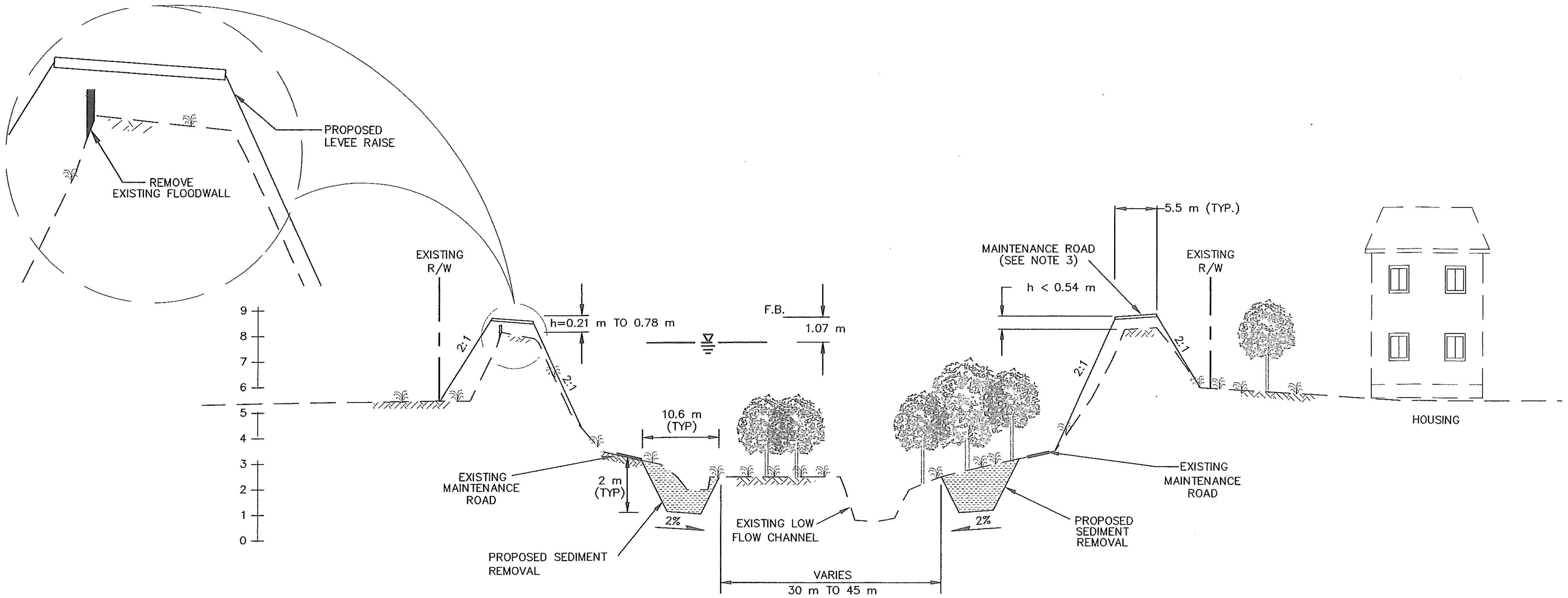
LOWER GUADALUPE RIVER
FLOOD PROTECTION PROJECT
STA 9+245 TO STA 10+127

TYPICAL SECTION

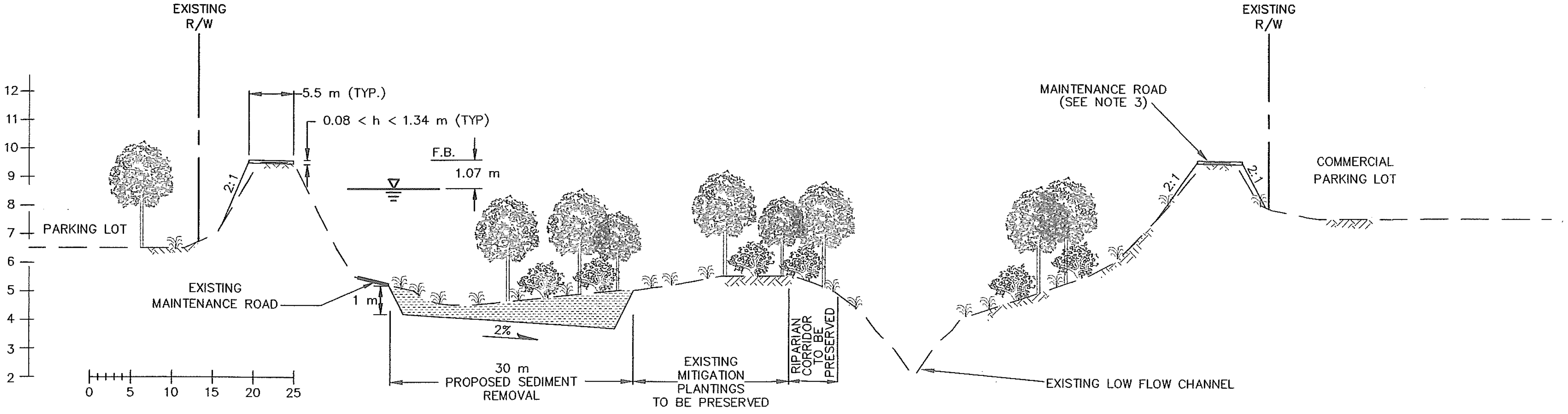
VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE N.T.S.
SHEET
25
25 OF 45

[NOT FOR CONSTRUCTION]


PROPOSED LEVEE RAISE
REMOVE EXISTING FLOODWALL
EXISTING R/W
h=0.21 m TO 0.78 m
2:1
2:1
F.B.
1.07 m
9
8
7
6
5
4
3
2
1
0
10.6 m (TYP)
2 m (TYP)
2%
EXISTING MAINTENANCE ROAD
PROPOSED SEDIMENT REMOVAL
EXISTING LOW FLOW CHANNEL
VARIES
30 m TO 45 m
2%
PROPOSED SEDIMENT REMOVAL
EXISTING MAINTENANCE ROAD
MAINTENANCE ROAD (SEE NOTE 3)
5.5 m (TYP.)
h < 0.54 m
2:1
2:1
EXISTING R/W
HOUSING

A
—
STA 10+127 TO STA 11+795
HETCH-HETCHY PIPELINE TO MONTAGUE EXPRESSWAY
REACH D
NTS


EXISTING R/W
12
11
10
9
8
7
6
5
4
3
2
PARKING LOT
5.5 m (TYP.)
0.08 < h < 1.34 m (TYP)
F.B.
1.07 m
2:1
EXISTING MAINTENANCE ROAD
1 m
2%
0
5
10
15
20
25
30 m
PROPOSED SEDIMENT REMOVAL
EXISTING MITIGATION PLANTINGS TO BE PRESERVED
RIPARIAN CORRIDOR TO BE PRESERVED
EXISTING LOW FLOW CHANNEL
MAINTENANCE ROAD (SEE NOTE 3)
2:1
2:1
EXISTING R/W
COMMERCIAL PARKING LOT

B
—
STA 11+855 TO STA 13+670
MONTAGUE EXPRESSWAY TO TRIMBLE ROAD
REACH C
NTS

DESIGN WATER SURFACE

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

1. SECTION CUT LOOKING UPSTREAM
2. Q DESIGN = 481.4 cms (17,000 cfs)
3. MAINTENANCE ROAD PAVING – 152 mm (6") MIN. WIDTH 5.5 m.
4. ALL EXISTING LEVEES WILL BE STABILITY TESTED
5. FLOODWALLS WILL BE ARCHITECTURALLY TREATED.

CH2MHILL
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SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04
CIVIL

DATE AUG. 2001
DESIGN JAM
DRAWN JAM
CHECKED EG

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
PROJECT ENGINEER
DATE

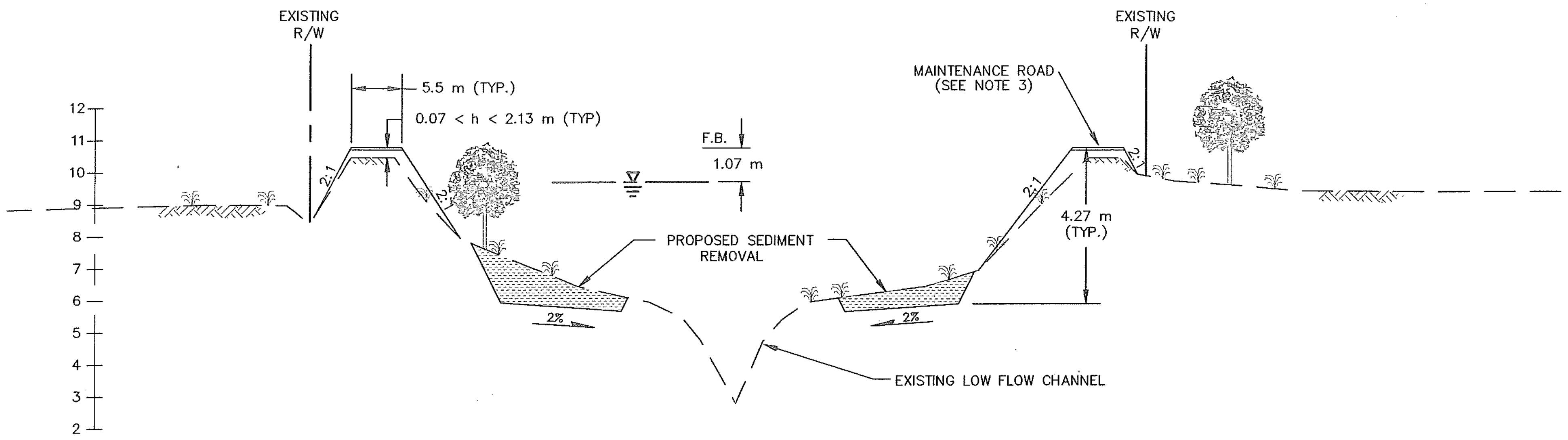
LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT
STA 10+127 TO STA 11+795
STA 11+855 TO STA 13+670
TYPICAL SECTIONS

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

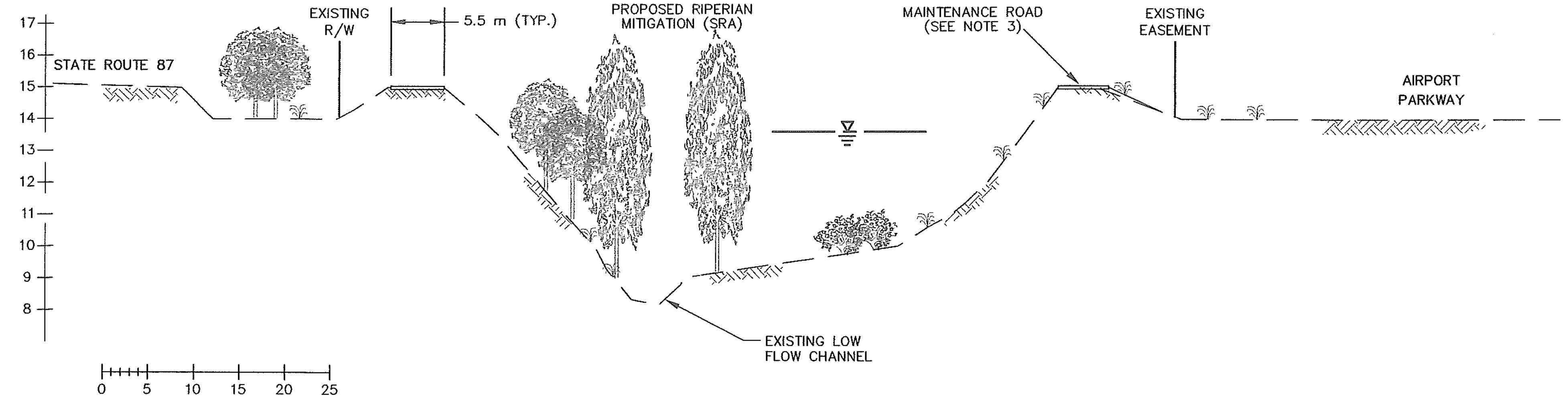
SCALE N.T.S.
SHEET
26
26 OF 45

PROJECT: 153735
DWG NAME: Acad\Rprt\S26-RPT.dwg
X-REF(S): Acad\Xrefs\SC-bdr1.dwg

Metric



A STA 13+730 TO STA 14+495
TRIMBLE ROAD TO HIGHWAY 101
REACH B
NTS



B STA 14+500 TO STA 16+500
REACH A
NTS

▽ DESIGN WATER SURFACE

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES
1. SECTION CUT LOOKING UPSTREAM
2. Q DESIGN = 481.4 cms (17,000 cfs)
3. MAINTENANCE ROAD PAVING – 152 mm (6") MIN. WIDTH 5.5 m.
4. ALL EXISTING LEVEES WILL BE STABILITY TESTED
5. FLOODWALLS WILL BE ARCHITECTURALLY TREATED.

CH2MHILL
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SAN JOSE, CALIFORNIA 95112–4524
(408)436–4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04

DATE AUG. 2001
DESIGN JAM
DRAWN JAM
CHECKED EG

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
DATE
PROJECT ENGINEER

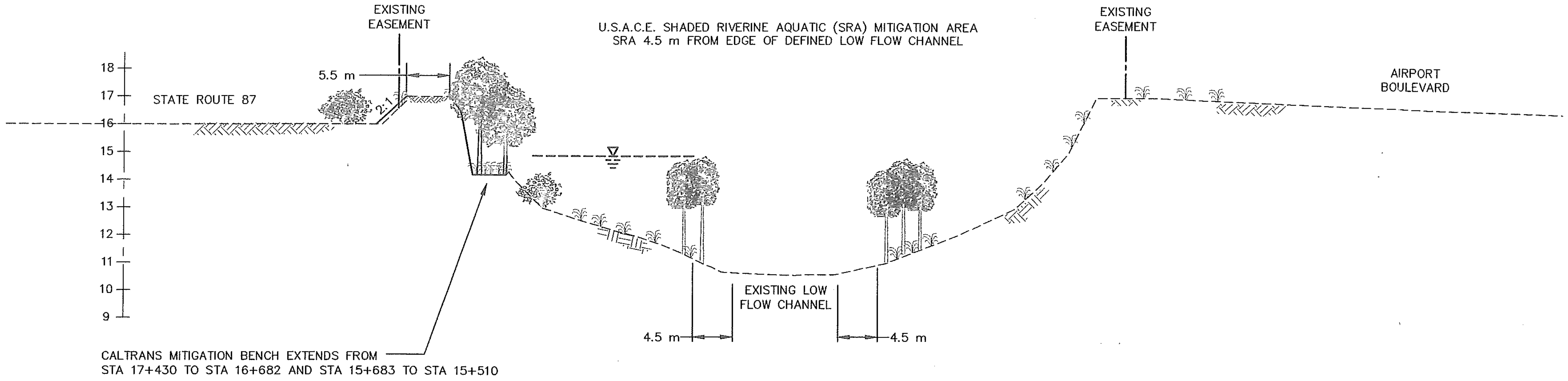
LOWER GUADALUPE RIVER
FLOOD PROTECTION PROJECT
STA 13+730 TO STA 14+495
STA 14+500 TO STA 16+500
TYPICAL SECTIONS

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

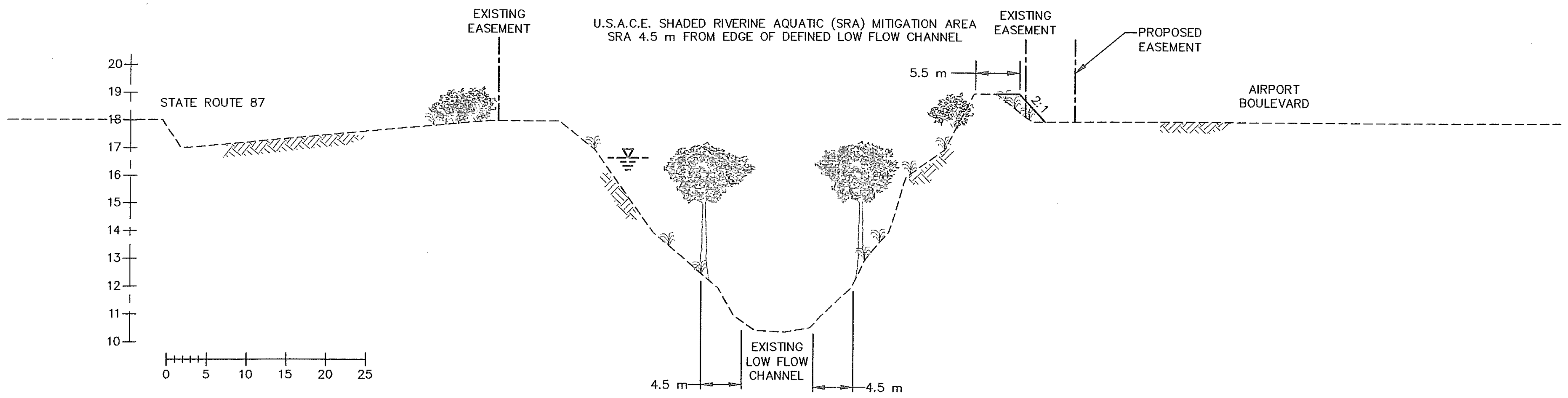
SCALE N.T.S.
SHEET 27
27 OF 45

[NOT FOR CONSTRUCTION]

PROJECT: 153735
DWG NAME:Acad\Rprt\S27–RPT.dwg
X–REF(S):Acad\Xrefs\SC–bdr1.dwg


EXISTING EASEMENT
U.S.A.C.E. SHADED RIVERINE AQUATIC (SRA) MITIGATION AREA
SRA 4.5 m FROM EDGE OF DEFINED LOW FLOW CHANNEL
EXISTING EASEMENT
5.5 m
2:1
STATE ROUTE 87
AIRPORT BOULEVARD
18
17
16
15
14
13
12
11
10
9
EXISTING LOW FLOW CHANNEL
4.5 m
4.5 m
CALTRANS MITIGATION BENCH EXTENDS FROM STA 17+430 TO STA 16+682 AND STA 15+683 TO STA 15+510

A — STA 15+720 TO 15+810 & 16+075 TO 17+010
UNRESTRICTED SHADED RIVERINE AREA
REACH A (MINIMAL WORK PROPOSED)
NTS



B — STA 17+000 TO 17+520
RESTRICTED SHADED RIVERINE AREA
REACH A (MINIMAL WORK PROPOSED)
NTS

▽ DESIGN WATER SURFACE

[NOT FOR CONSTRUCTION]

PROJECT: 153735
DWG NAME: Acad\Rpt\S28-RPT.dwg
X-REF(S): Acad\Xrefs\SC-bdr1.dwg

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES
1. SECTION CUT LOOKING UPSTREAM
2. Q DESIGN = 481.4 cms (17,000 cfs)
3. MAINTENANCE ROAD PAVING – 152 mm (6") MIN. WIDTH 5.5 m.
4. ALL EXISTING LEVEES WILL BE STABILITY TESTED
5. FLOODWALLS WILL BE ARCHITECTURALLY TREATED.

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04

DATE	AUG. 2001
DESIGN	JAM
DRAWN	JAM
CHECKED	EG

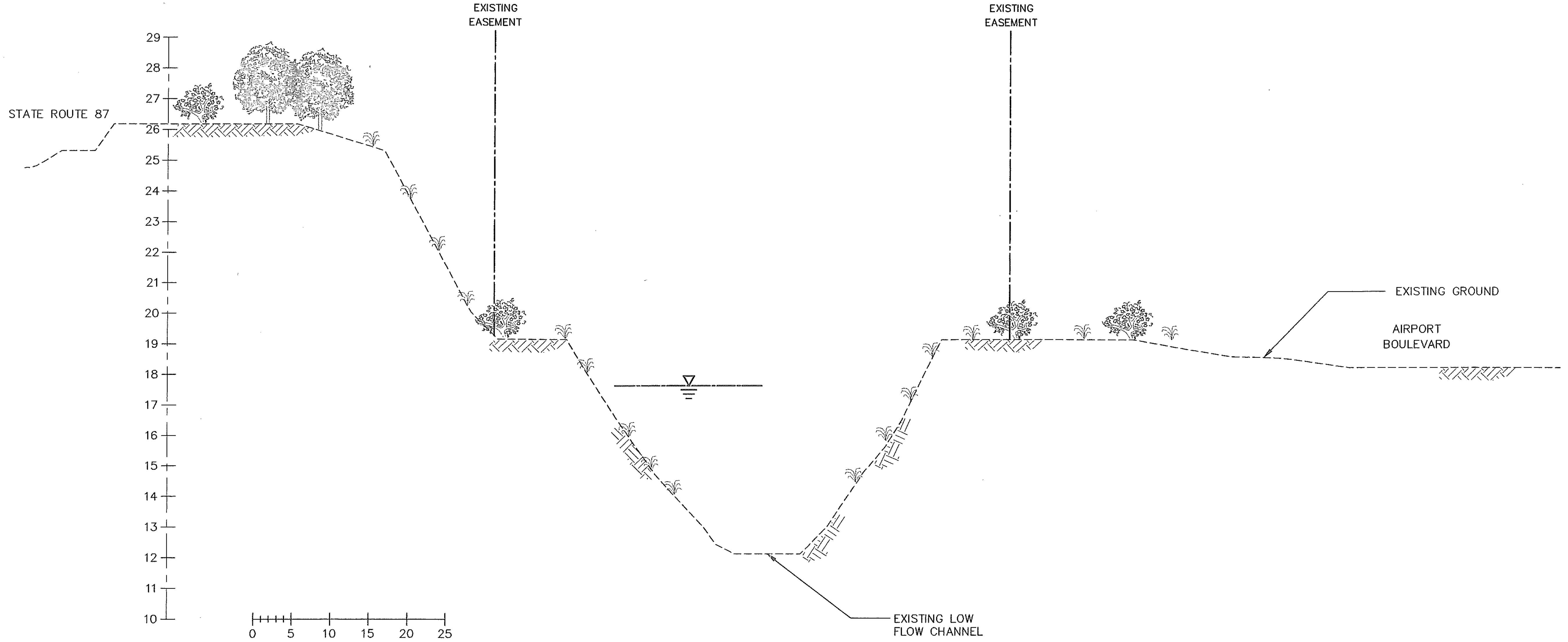
Santa Clara Valley Water District
ACCEPTED BY DISTRICT
DATE
PROJECT ENGINEER

LOWER GUADALUPE RIVER
FLOOD PROTECTION PROJECT
STA 15+720 TO STA 17+010
STA 17+000 TO STA 17+520
TYPICAL SECTIONS

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE
N.T.S.
SHEET
28
28 OF 45

Metric



(A) STA 17+460 TO 17+613
(–) STA 17+460 TO HIGHWAY 880
REACH A (NO WORK PROPOSED)
NTS

▽ DESIGN WATER SURFACE

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES
1. SECTION CUT LOOKING UPSTREAM
2. Q DESIGN = 481.4 cms (17,000 cfs)
3. MAINTENANCE ROAD PAVING – 152 mm (6") MIN. WIDTH 5.5 m.
4. ALL EXISTING LEVEES WILL BE STABILITY TESTED
5. FLOODWALLS WILL BE ARCHITECTURALLY TREATED.

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04
CIVIL

DATE AUG. 2001
DESIGN JAM
DRAWN JAM
CHECKED EG

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
DATE
PROJECT ENGINEER

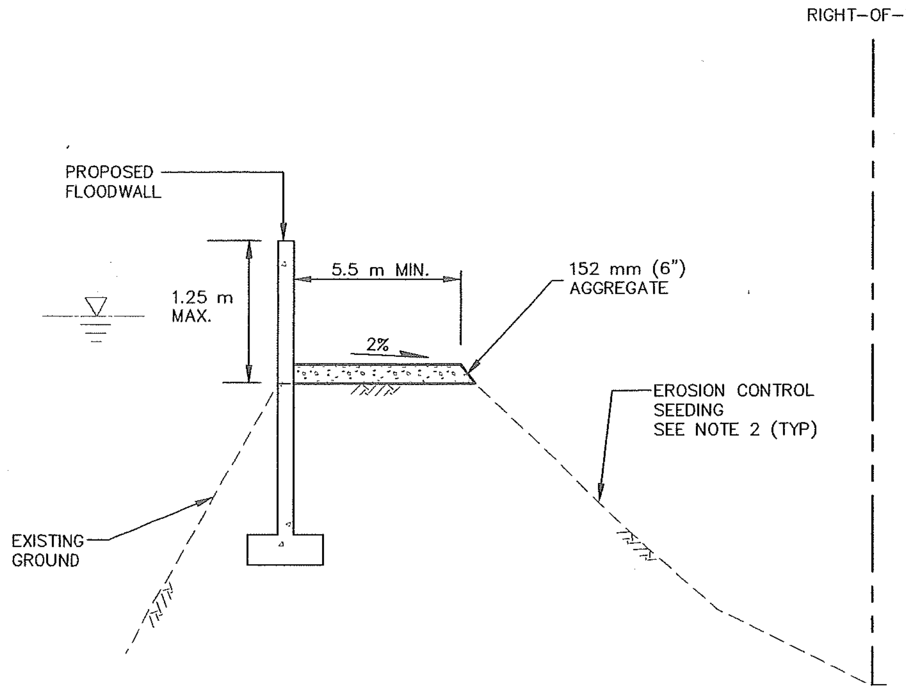
LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT
STA 17+460 TO STA 17+613
STA 17+460 TO HIGHWAY 880
TYPICAL SECTIONS

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE N.T.S.
SHEET 29
29 OF 45

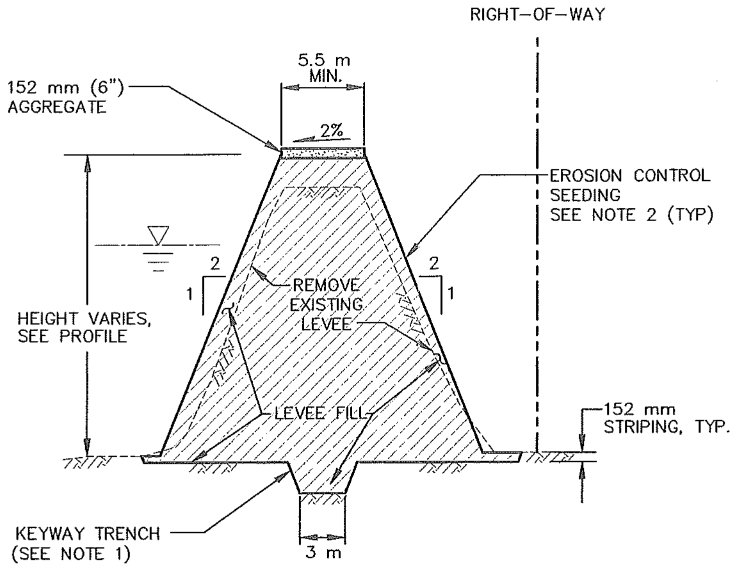
PROJECT: 153735
DWG NAME: Acad\Rpt\S29-RPT.dwg
X-REF(S):

Metric



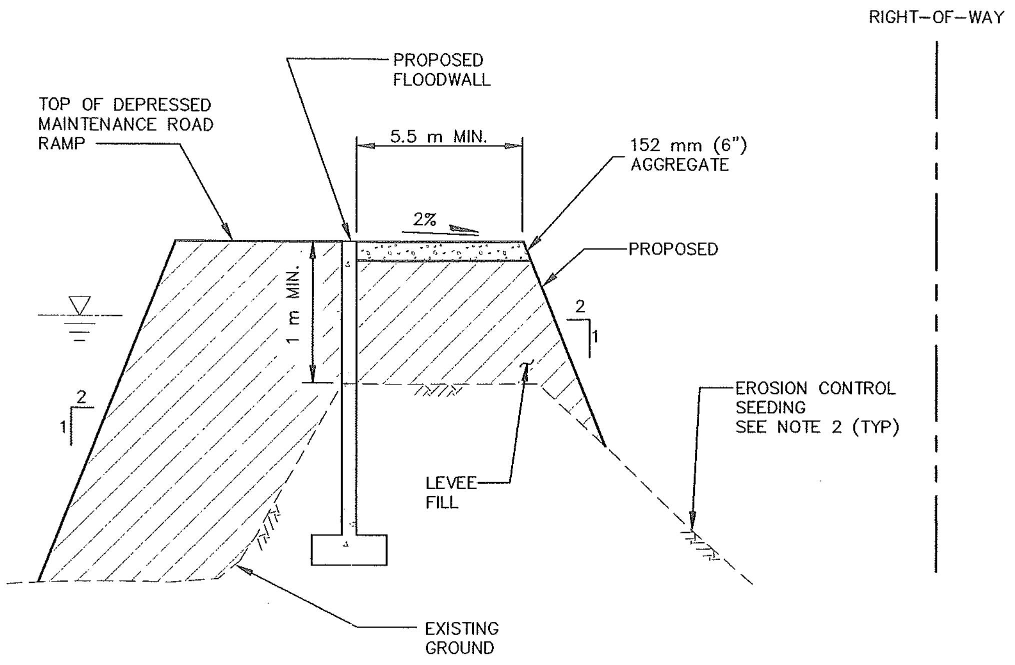
① FLOODWALL TYPICAL SECTION

NTS



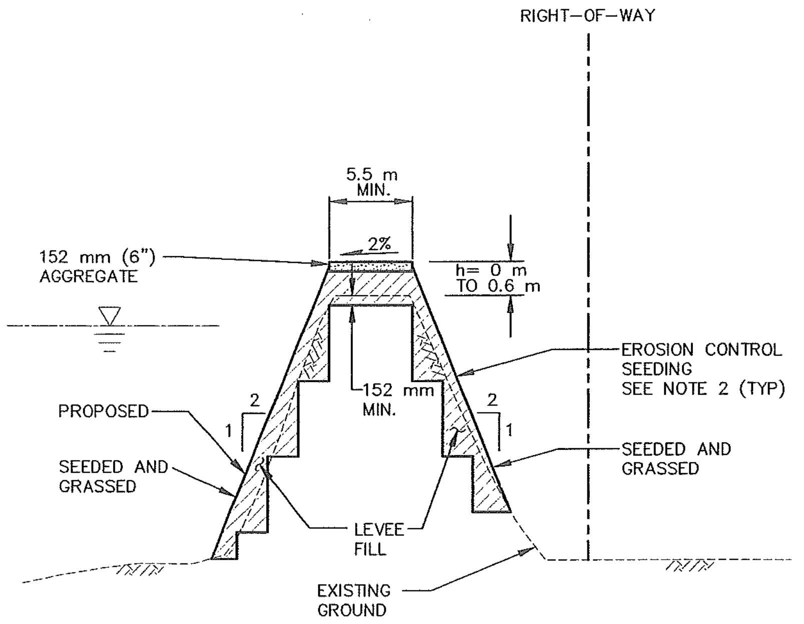
③ LEVEE REHABILITATION TYPICAL SECTION (REFER TO GEOTECHNICAL REPORT FOR LOCATIONS)

NTS



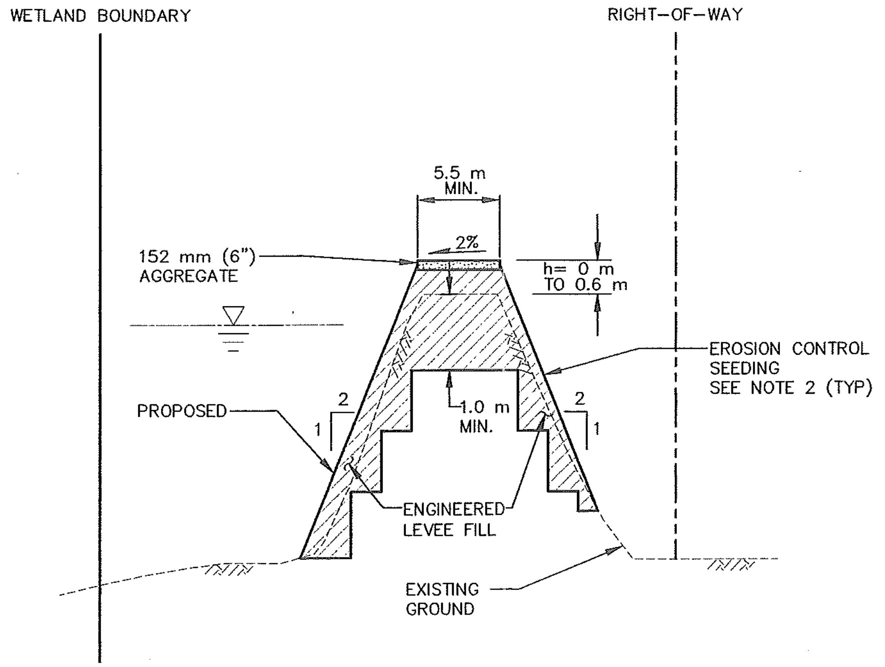
⑤ FLOODWALL - RAMP SECTION TYPICAL SECTION

NTS



② LEVEE FILL TYPICAL SECTION

NTS



④ LEVEE FILL (ENGINEERED) TYPICAL SECTION

NTS

LEVEE REHABILITATION NOTES:

1. THE DEPTH OF THE KEYWAY TRENCH SHALL BE 1.82 m EXCEPT FOR LEVEE HEIGHTS LESS THAN 1.82 m; FOR THESE THE DEPTH SHALL EQUAL THE LEVEE HEIGHT. WHERE THE KEYWAY INVERT IS FOUNDED IN PERVIOUS (GRANULAR) SOILS AS DETERMINED BY INSPECTOR, THE EXCAVATION SHALL CONTINUE TO A DEPTH SUFFICIENT TO REMOVE THE PERVIOUS MATERIALS. HOWEVER, THE KEYWAY DEPTH SHALL NOT BE DEEPER THAN THE REQUIRED LEVEE HEIGHT AT THAT LOCATION.
2. EROSION CONTROL SEEDING SHALL BE PLACED ON ALL EARTH SURFACES CONSTRUCTED, OR DISTURBED BY CONTRACTOR, INCLUDING ALL LEVEE SIDESLOPES AND BENCH AREAS.

NOT FOR CONSTRUCTION

PROJECT: 153735
DWG NAME: Acad\Rprt\S30-RPT.dwg
X-REF(S): \Acad\Xrefs\SC-bdr1.dwg

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04

DATE AUG. 2001
DESIGN JAM
DRAWN JAM
CHECKED EG

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
DATE
PROJECT ENGINEER

LOWER GUADALUPE RIVER
FLOOD PROTECTION PROJECT
TYPICAL SECTIONS
LEVEE MODIFICATIONS

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE

SHEET
30
30 OF 45

Metric

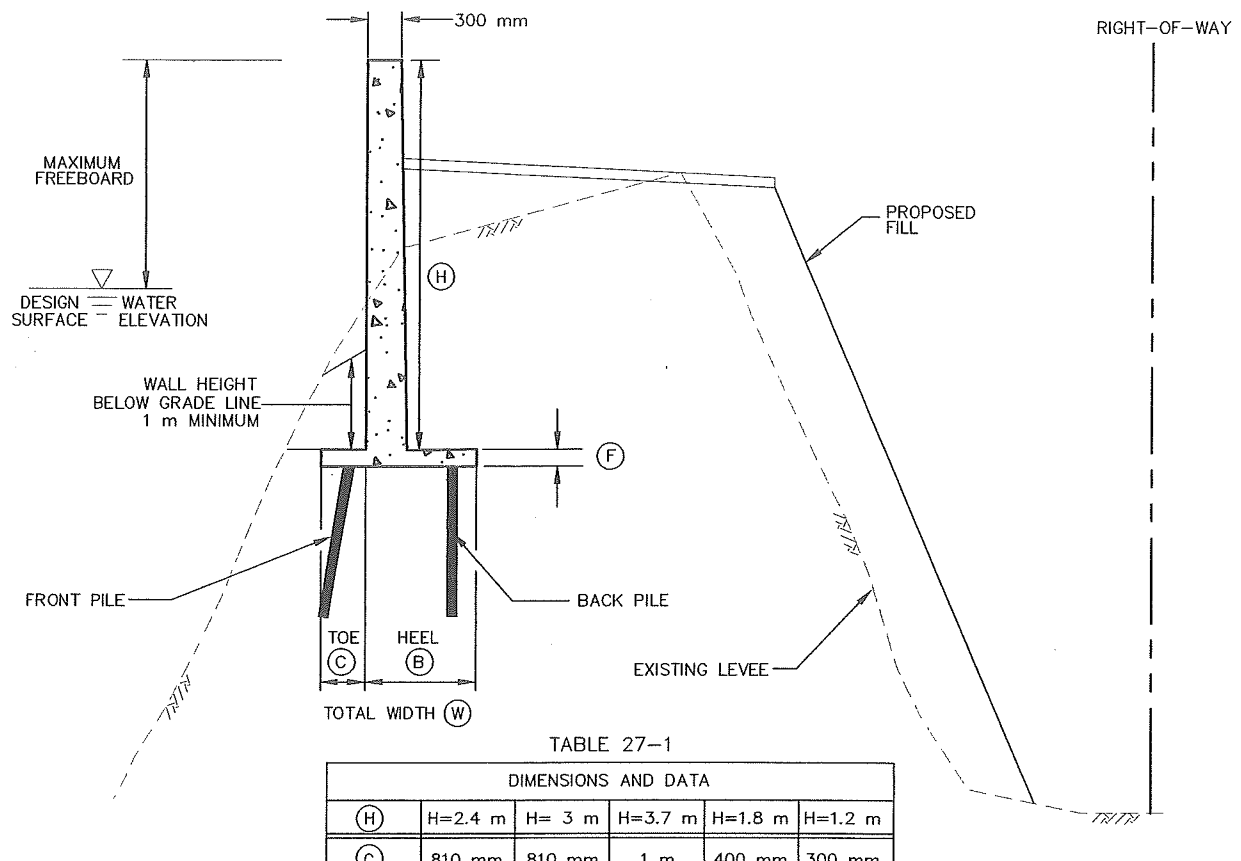
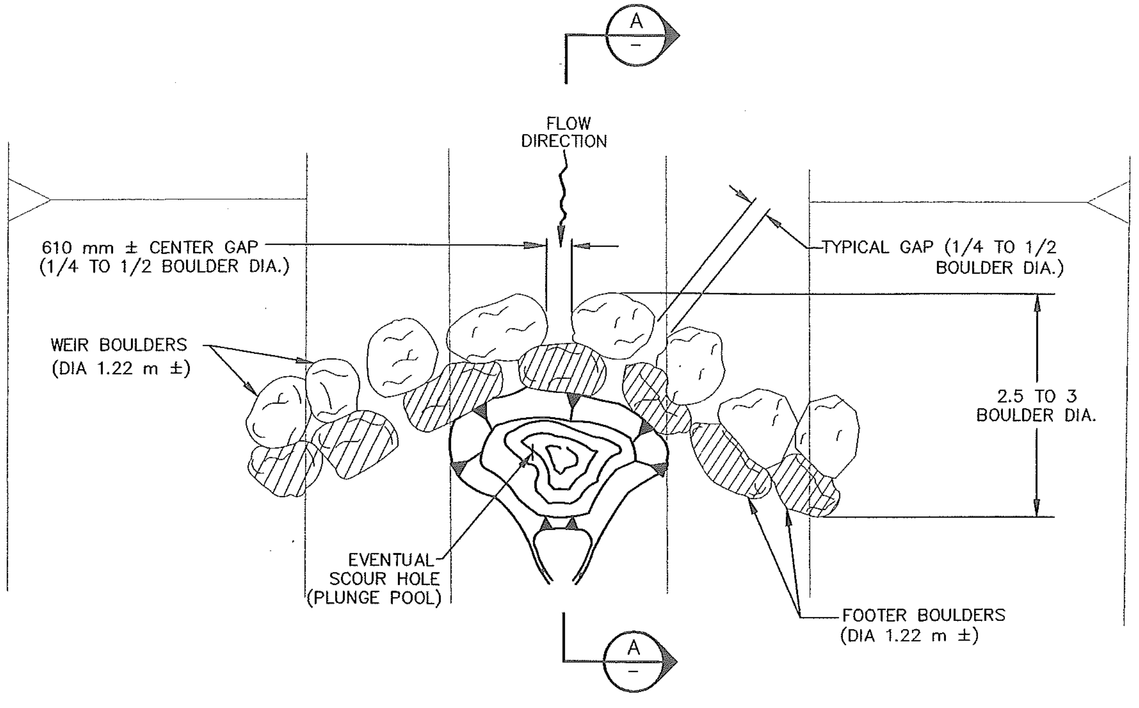


TABLE 27-1

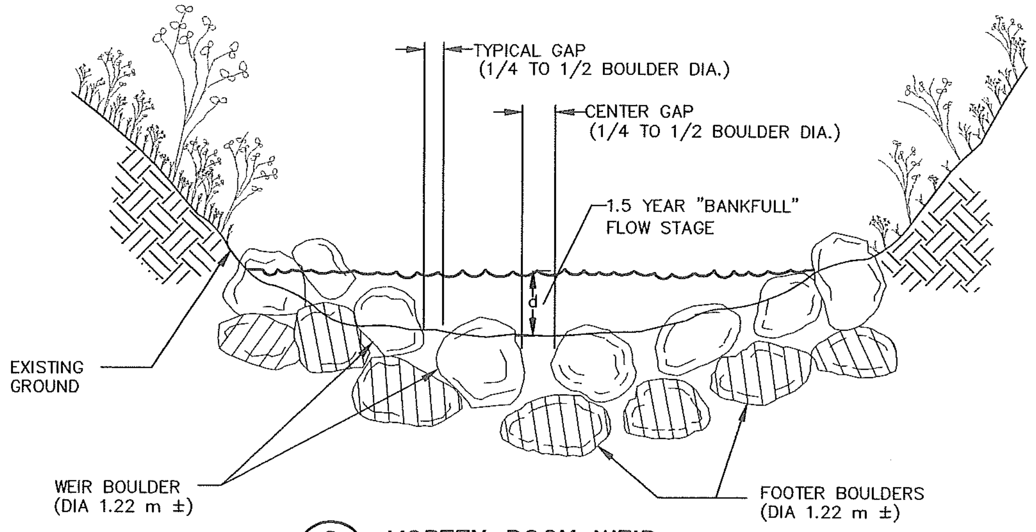
DIMENSIONS AND DATA					
(H)	H=2.4 m	H= 3 m	H=3.7 m	H=1.8 m	H=1.2 m
(C)	810 mm	810 mm	1 m	400 mm	300 mm
(B)	1.3 m	1.3 m	2 m	900 mm	700 mm
(W)	2.1 m	2.4 m	3.05 m	1.3 m	1 m
(F)	460mm	460 mm	480 mm	400 mm	400 mm

1 FLOODWALL STRUCTURAL DETAIL
CAL-TRANS TYPE I
NTS



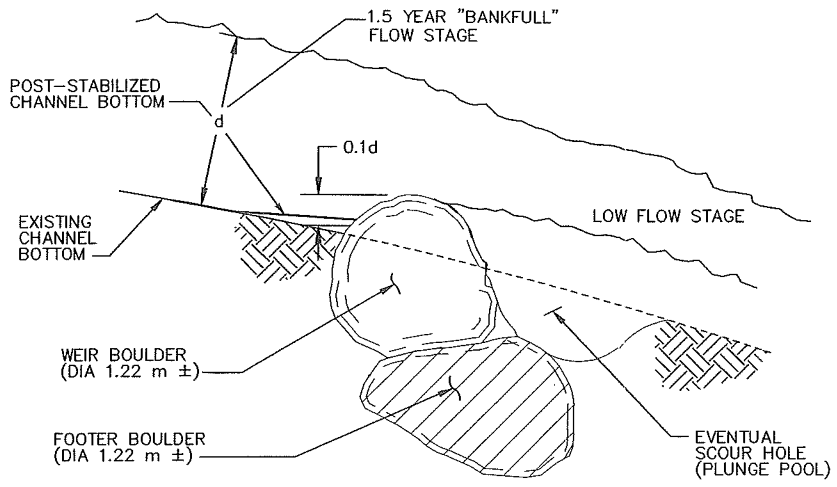
(A)
FLOW DIRECTION
610 mm ± CENTER GAP (1/4 TO 1/2 BOULDER DIA.)
TYPICAL GAP (1/4 TO 1/2 BOULDER DIA.)
WEIR BOULDERS (DIA 1.22 m ±)
2.5 TO 3 BOULDER DIA.
EVENTUAL SCOUR HOLE (PLUNGE POOL)
FOOTER BOULDERS (DIA 1.22 m ±)
(A)

3 VORTEX ROCK WEIR
PLAN VIEW
NTS



TYPICAL GAP (1/4 TO 1/2 BOULDER DIA.)
CENTER GAP (1/4 TO 1/2 BOULDER DIA.)
1.5 YEAR "BANKFULL" FLOW STAGE
d
EXISTING GROUND
WEIR BOULDER (DIA 1.22 m ±)
FOOTER BOULDERS (DIA 1.22 m ±)

2 VORTEX ROCK WEIR
TYPICAL SECTION
LOOKING UPSTREAM
NTS



1.5 YEAR "BANKFULL" FLOW STAGE
POST-STABILIZED CHANNEL BOTTOM
d
0.1d
LOW FLOW STAGE
EXISTING CHANNEL BOTTOM
WEIR BOULDER (DIA 1.22 m ±)
FOOTER BOULDER (DIA 1.22 m ±)
EVENTUAL SCOUR HOLE (PLUNGE POOL)

A/31 VORTEX ROCK WEIR
PROFILE VIEW
NTS

[NOT FOR CONSTRUCTION]

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04

DATE	AUG. 2001
DESIGN	JAM
DRAWN	JAM
CHECKED	EG

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
DATE
PROJECT ENGINEER

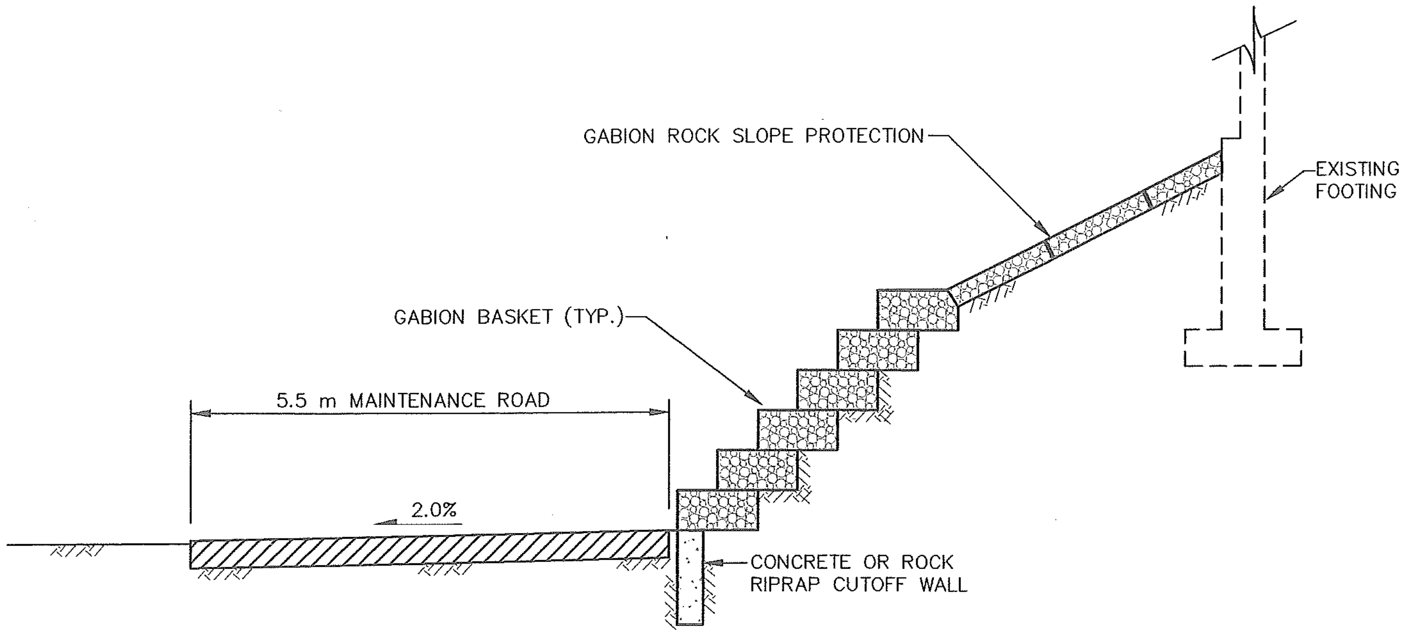
LOWER GUADALUPE RIVER
FLOOD PROTECTION PROJECT
SECTIONS AND DETAILS
FLOODWALL AND ROCK WEIR DETAILS

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

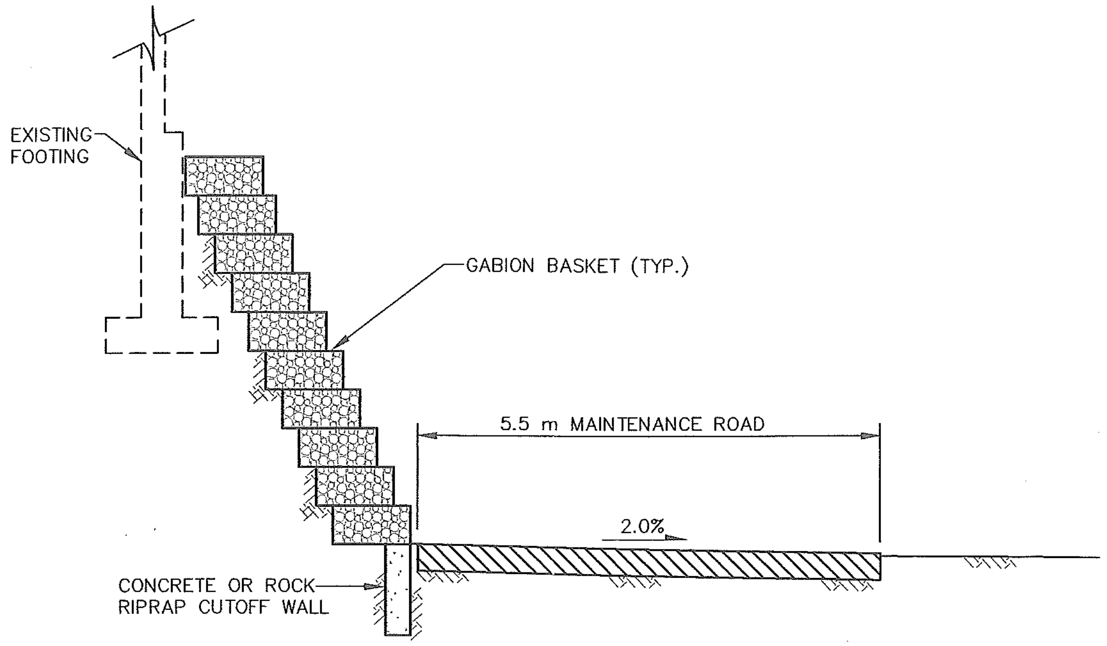
SCALE N.T.S.
SHEET 31
31 OF 45

PROJECT: 153735
DWG NAME: Acad\Rprt\S31-RPT.dwg
X-REF(S): Acad\Xrefs\SC-bdr1.dwg

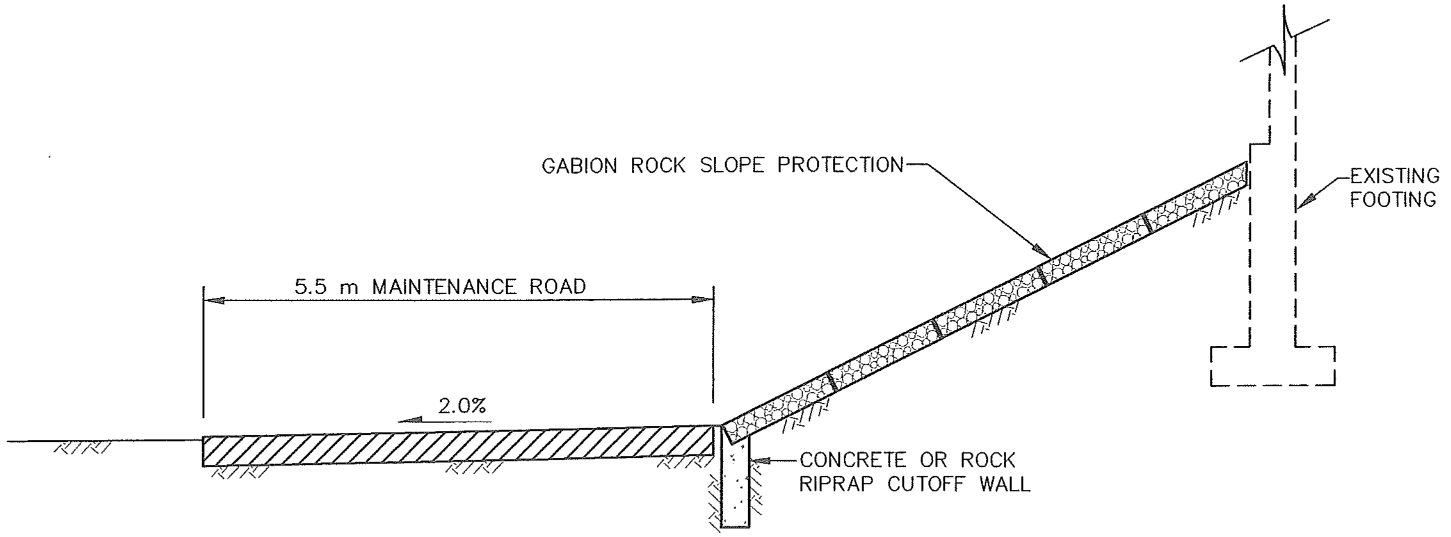
Metric


GABION ROCK SLOPE PROTECTION
EXISTING FOOTING
GABION BASKET (TYP.)
5.5 m MAINTENANCE ROAD
2.0%
CONCRETE OR ROCK RIPRAP CUTOFF WALL

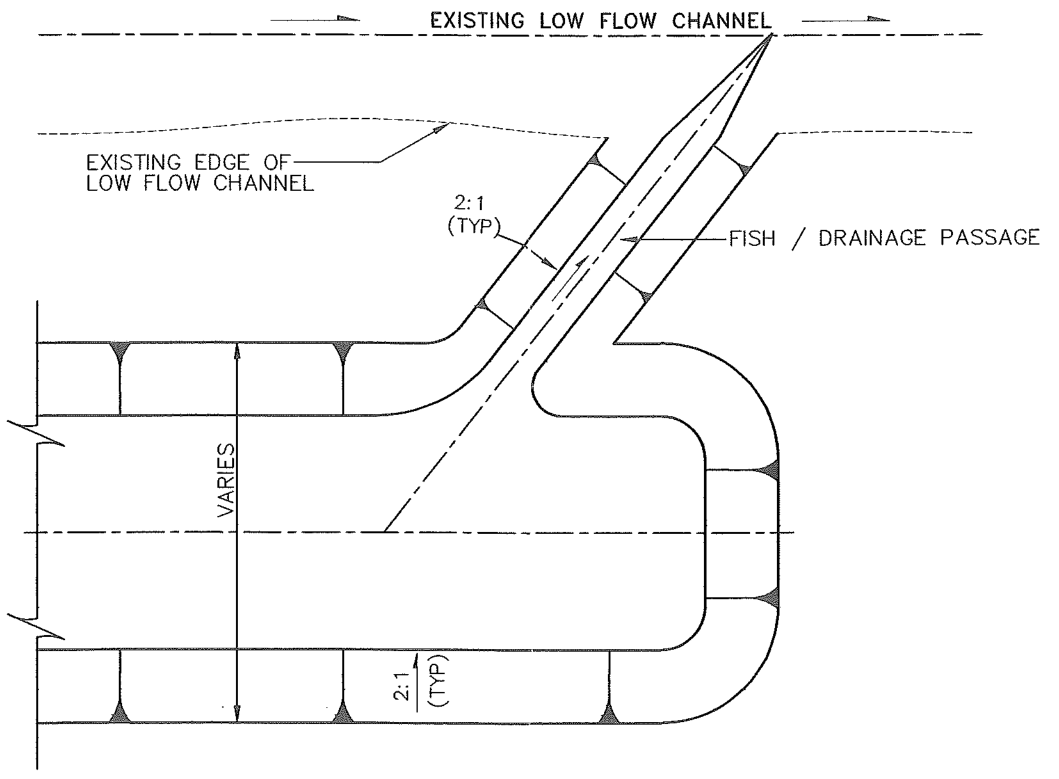
1/– SLOPE PROTECTION DETAIL #1
SECTION VIEW
COMBINED GABION WALL/SLOPE
NTS



3/– SLOPE PROTECTION DETAIL #3
SECTION VIEW
STEEP GABION WALL
NTS


GABION ROCK SLOPE PROTECTION
EXISTING FOOTING
5.5 m MAINTENANCE ROAD
2.0%
CONCRETE OR ROCK RIPRAP CUTOFF WALL

2/– SLOPE PROTECTION DETAIL #2
SECTION VIEW
GABION SLOPE PROTECTION
NTS



4/– SEDIMENTATION CHANNEL TERMINATION DETAIL
NTS

[NOT FOR CONSTRUCTION]

PROJECT: 153735
DWG NAME: Acad\Rprt\S32-RPT.dwg
X-REF(S): Acad\Xrefs\SC-bdr1.dwg

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04
CIVIL

DATE AUG. 2001
DESIGN JAM
DRAWN JAM
CHECKED EG

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
DATE
PROJECT ENGINEER

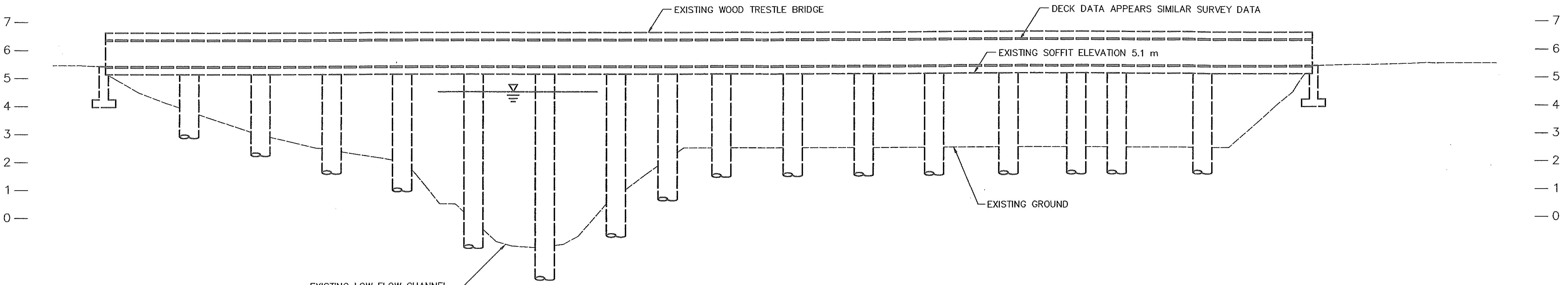
LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT
SECTIONS AND DETAILS
GABION AND SEDIMENTATION

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE N.T.S.
SHEET 32
32 OF 45

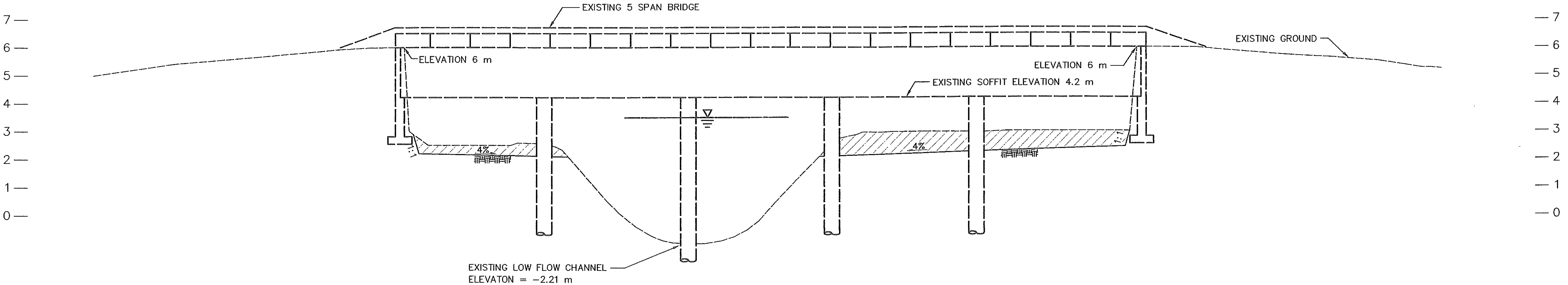
Metric

[NOT FOR CONSTRUCTION]


EXISTING WOOD TRESTLE BRIDGE
DECK DATA APPEARS SIMILAR SURVEY DATA
EXISTING SOFFIT ELEVATION 5.1 m
EXISTING GROUND
EXISTING LOW FLOW CHANNEL
ELEVATON = -3.28 m
7
6
5
4
3
2
1
0

(A) UPRR BRIDGE
STA 7+008 - BEGIN PROJECT

NTS



(B) GOLD STREET BRIDGE
STA 7+120

NTS

PROPOSED EXCAVATION ▨

DESIGN WATER SURFACE

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

1. SECTION CUT LOOKING UPSTREAM.
2. BRIDGE DATA TAKEN FROM AS-BUILT AND RECORD DRAWINGS.

CH2MHILL

1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04
CIVIL

DATE AUG. 2001
DESIGN MTR
DRAWN MTR
CHECKED EG

Santa Clara Valley Water District

ACCEPTED BY DISTRICT

PROJECT ENGINEER

DATE

LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT
STA 7+008 AND STA 7+120 BRIDGE SECTIONS

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

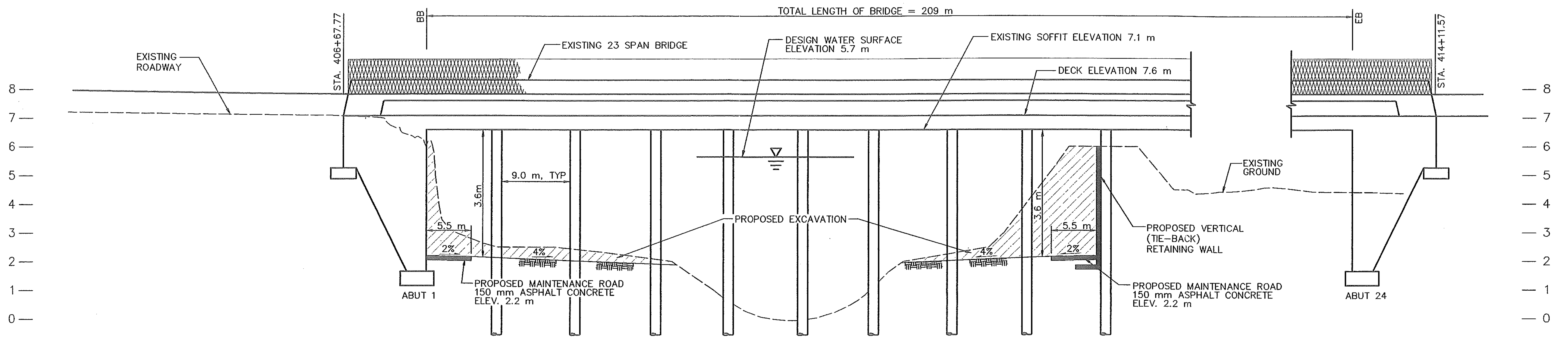
SCALE NTS

SHEET 33

33 OF 45

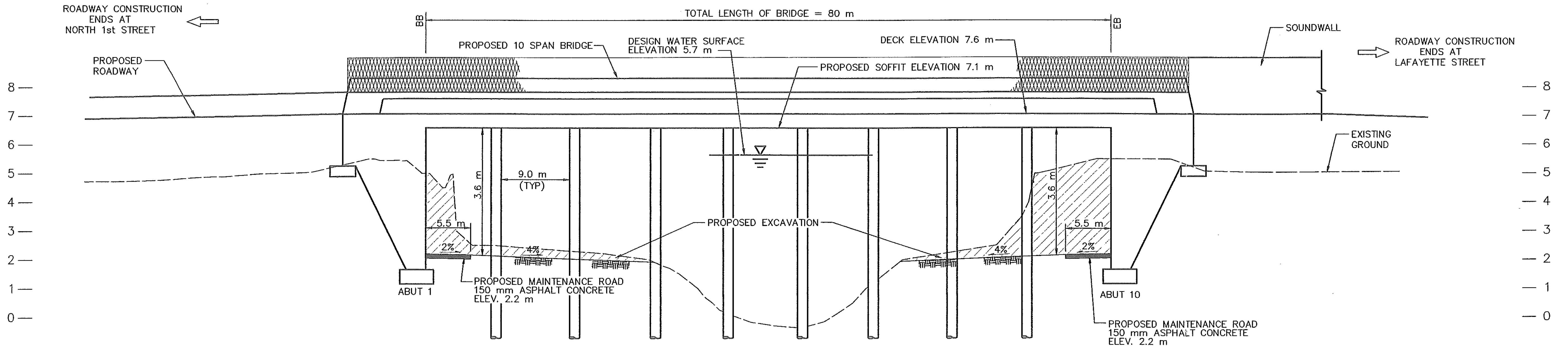
PROJECT: 153735
DWG NAME:Acad\Rpt\S33-RPT.dwg
X-REF(S):SC-BDR1,XSECTYP1

Metric


TOTAL LENGTH OF BRIDGE = 209 m
BB
EB
STA. 406+67.77
STA. 414+11.57
EXISTING ROADWAY
EXISTING 23 SPAN BRIDGE
DESIGN WATER SURFACE ELEVATION 5.7 m
EXISTING SOFFIT ELEVATION 7.1 m
DECK ELEVATION 7.6 m
9.0 m, TYP
3.6m
3.6 m
5.5 m
5.5 m
2%
4%
4%
2%
PROPOSED EXCAVATION
EXISTING GROUND
PROPOSED VERTICAL (TIE-BACK) RETAINING WALL
PROPOSED MAINTENANCE ROAD 150 mm ASPHALT CONCRETE ELEV. 2.2 m
PROPOSED MAINTENANCE ROAD 150 mm ASPHALT CONCRETE ELEV. 2.2 m
ABUT 1
ABUT 24
8
7
6
5
4
3
2
1
0

(A/–) EXISTING HWY 237 BRIDGE (WESTBOUND)
STA 8+020

NTS


ROADWAY CONSTRUCTION ENDS AT NORTH 1st STREET
TOTAL LENGTH OF BRIDGE = 80 m
BB
EB
SOUNDWALL
ROADWAY CONSTRUCTION ENDS AT LAFAYETTE STREET
PROPOSED ROADWAY
PROPOSED 10 SPAN BRIDGE
DESIGN WATER SURFACE ELEVATION 5.7 m
DECK ELEVATION 7.6 m
PROPOSED SOFFIT ELEVATION 7.1 m
EXISTING GROUND
9.0 m (TYP)
3.6 m
3.6 m
5.5 m
5.5 m
2%
4%
4%
2%
PROPOSED EXCAVATION
PROPOSED MAINTENANCE ROAD 150 mm ASPHALT CONCRETE ELEV. 2.2 m
PROPOSED MAINTENANCE ROAD 150 mm ASPHALT CONCRETE ELEV. 2.2 m
ABUT 1
ABUT 10
8
7
6
5
4
3
2
1
0

(B/–) PROPOSED HWY 237 BRIDGE (EASTBOUND)
STA 8+056

NTS

NOTE: REFER TO SHEETS 41 AND 42
FOR BRIDGE CONSTRUCTION STAGING.

LEGEND:

▽ DESIGN WATER SURFACE

[NOT FOR CONSTRUCTION]

PROJECT: 153735
DWG NAME: Acad\Rprt\S34-RPT.dwg
X-REF(S): SC-BDR1, XSECTYP1

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

1. SECTION CUT LOOKING UPSTREAM.
2. BRIDGE DATA TAKEN FROM AS-BUILT AND RECORD DRAWINGS.

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04

DATE AUG. 2001
DESIGN MTR
DRAWN MTR
CHECKED EG

Santa Clara Valley Water District

ACCEPTED BY DISTRICT

DATE

PROJECT ENGINEER

LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT
STA 8+020 AND STA 8+056 BRIDGE SECTIONS

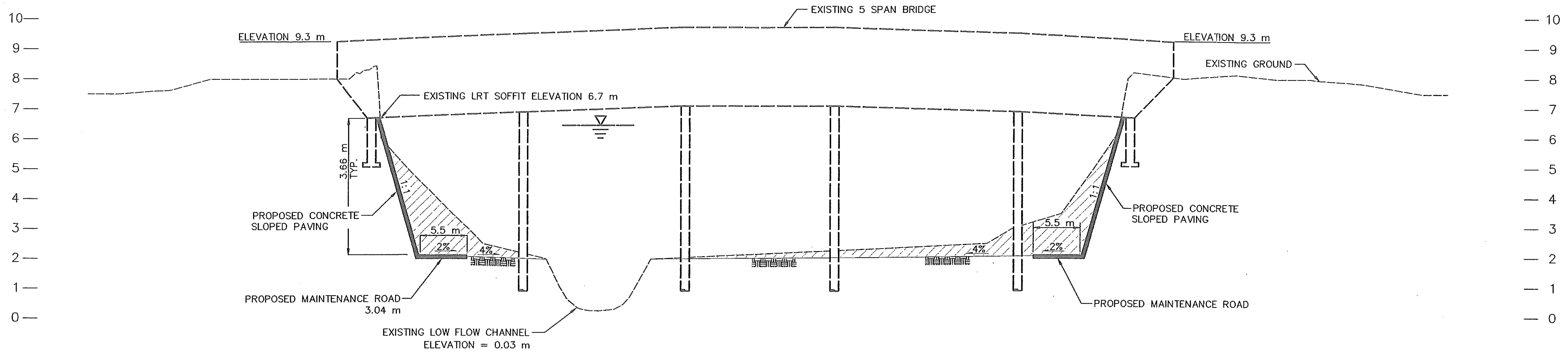
VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE NTS

SHEET 34

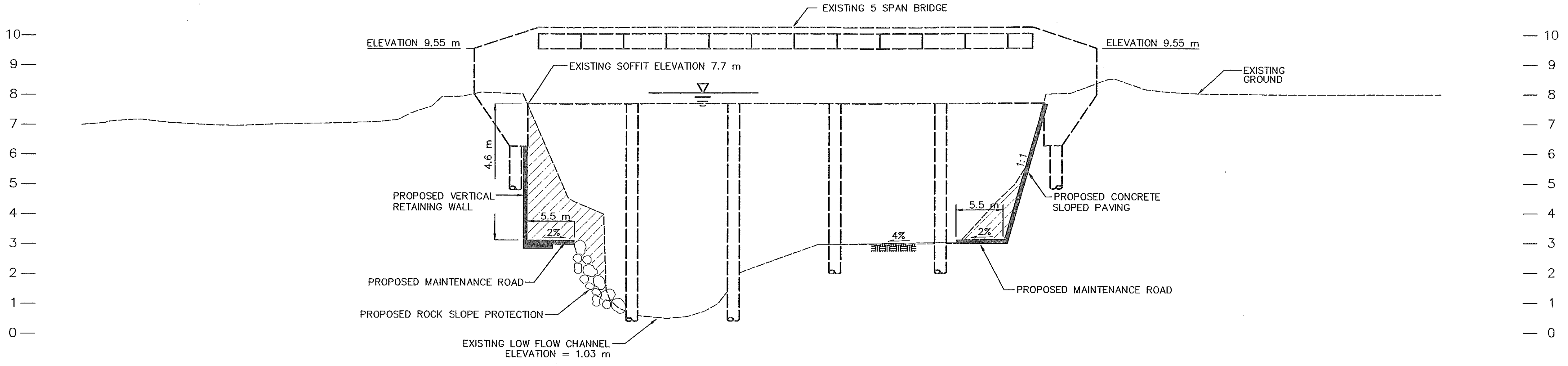
34 OF 45

Metric


EXISTING 5 SPAN BRIDGE
ELEVATION 9.3 m
ELEVATION 9.3 m
EXISTING GROUND
EXISTING LRT SOFFIT ELEVATION 6.7 m
3.66 m TYP.
1:1
1:1
PROPOSED CONCRETE SLOPED PAVING
PROPOSED CONCRETE SLOPED PAVING
5.5 m
2%
4%
4%
5.5 m
2%
PROPOSED MAINTENANCE ROAD 3.04 m
PROPOSED MAINTENANCE ROAD
EXISTING LOW FLOW CHANNEL ELEVATION = 0.03 m
10
9
8
7
6
5
4
3
2
1
0

Ⓐ TASMAN DRIVE BRIDGE
STA 9+260

NTS


EXISTING 5 SPAN BRIDGE
ELEVATION 9.55 m
ELEVATION 9.55 m
EXISTING GROUND
EXISTING SOFFIT ELEVATION 7.7 m
4.6 m
1:1
PROPOSED VERTICAL RETAINING WALL
5.5 m
2%
PROPOSED CONCRETE SLOPED PAVING
5.5 m
2%
4%
PROPOSED MAINTENANCE ROAD
PROPOSED MAINTENANCE ROAD
PROPOSED ROCK SLOPE PROTECTION
EXISTING LOW FLOW CHANNEL ELEVATION = 1.03 m
10
9
8
7
6
5
4
3
2
1
0

Ⓑ MONTAGUE EXPRESSWAY BRIDGE
STA 11+843

NTS

▨ PROPOSED EXCAVATION

[NOT FOR CONSTRUCTION]

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

1. SECTION CUT LOOKING UPSTREAM.
2. BRIDGE DATA TAKEN FROM AS-BUILT AND RECORD DRAWINGS.

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04
CIVIL

DATE AUG. 2001
DESIGN MTR
DRAWN MTR
CHECKED EG

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
DATE
PROJECT ENGINEER

LOWER GUADALUPE RIVER
FLOOD PROTECTION PROJECT
STA 9+260 AND STA 11+843
BRIDGE SECTIONS

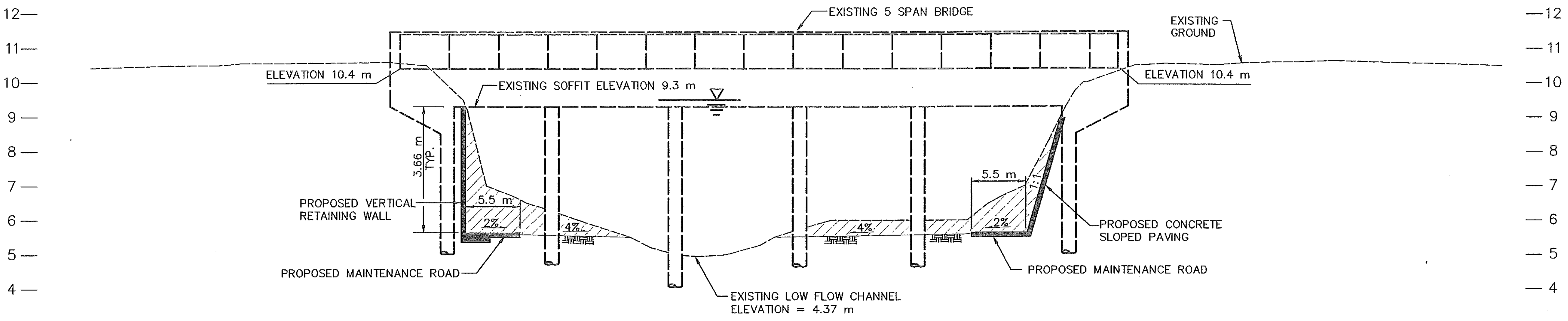
VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING
IF NOT ADJUST SCALES ACCORDINGLY

SCALE NTS

SHEET 35

35 OF 45

PROJECT: 153735
DWG NAME: Acad\Rpt\S35-RPT.dwg
X-REF(S): SC-BDR1 XSECTYP1


12
11
10
9
8
7
6
5
4
EXISTING 5 SPAN BRIDGE
EXISTING GROUND
ELEVATION 10.4 m
EXISTING SOFFIT ELEVATION 9.3 m
ELEVATION 10.4 m
3.66 m TYP.
5.5 m
5.5 m
1:1
PROPOSED VERTICAL RETAINING WALL
2%
4%
4%
2%
PROPOSED CONCRETE SLOPED PAVING
PROPOSED MAINTENANCE ROAD
PROPOSED MAINTENANCE ROAD
EXISTING LOW FLOW CHANNEL ELEVATION = 4.37 m
12
11
10
9
8
7
6
5
4

(A/–) TRIMBLE ROAD BRIDGE
STA 13+700

NTS

▨ PROPOSED EXCAVATION

▽ DESIGN WATER SURFACE

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

1. SECTION CUT LOOKING UPSTREAM.
2. BRIDGE DATA TAKEN FROM AS-BUILT AND RECORD DRAWINGS.

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04

DATE AUG. 2001
DESIGN MTR
DRAWN MTR
CHECKED EG

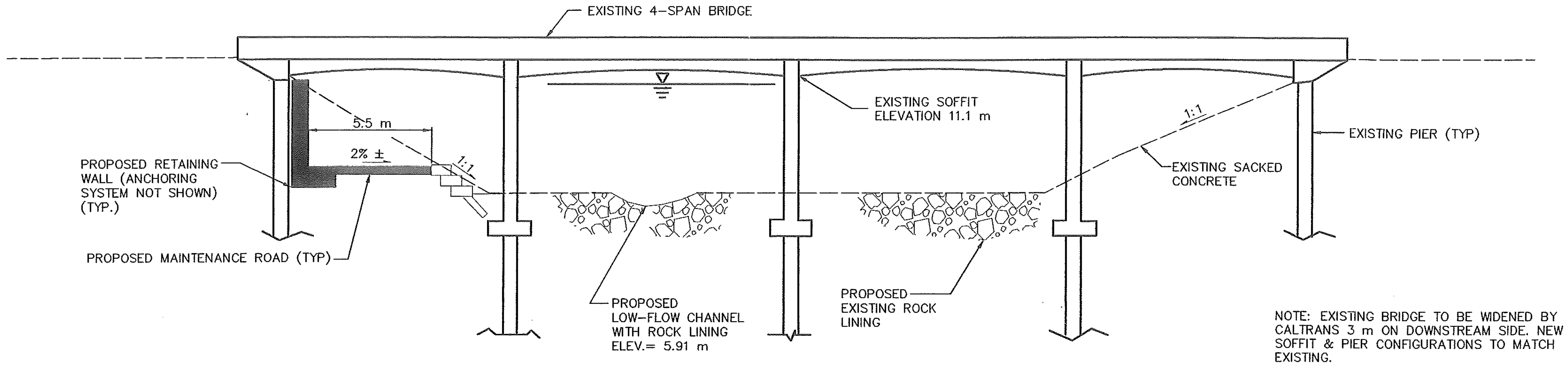
Santa Clara Valley Water District
ACCEPTED BY DISTRICT
PROJECT ENGINEER
DATE

LOWER GUADALUPE RIVER
FLOOD PROTECTION PROJECT
STA 13+700
BRIDGE SECTION

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE NTS
SHEET
36
36 OF 45

PROJECT: 153735
DWG NAME: Acad\Rprt\S36-RPT.dwg
X-REF(S): CS-BDR1,XSECTYP1

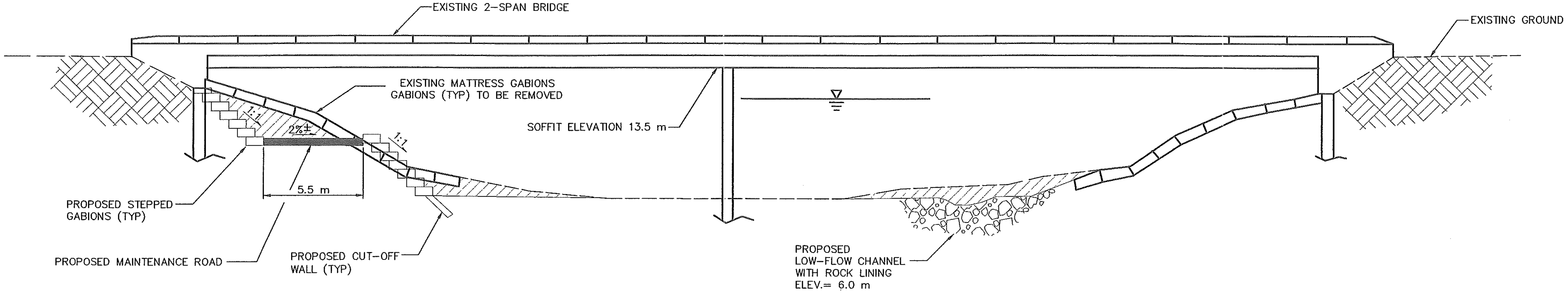

EXISTING 4–SPAN BRIDGE
EXISTING SOFFIT ELEVATION 11.1 m
EXISTING PIER (TYP)
5.5 m
2% ±
1:1
1:1
PROPOSED RETAINING WALL (ANCHORING SYSTEM NOT SHOWN) (TYP.)
PROPOSED MAINTENANCE ROAD (TYP)
EXISTING SACKED CONCRETE
PROPOSED LOW–FLOW CHANNEL WITH ROCK LINING ELEV.= 5.91 m
PROPOSED EXISTING ROCK LINING

NOTE: EXISTING BRIDGE TO BE WIDENED BY CALTRANS 3 m ON DOWNSTREAM SIDE. NEW SOFFIT & PIER CONFIGURATIONS TO MATCH EXISTING.

A
–

HWY 101 BRIDGE
STA 14+554

NTS


EXISTING 2–SPAN BRIDGE
EXISTING GROUND
EXISTING MATTRESS GABIONS GABIONS (TYP) TO BE REMOVED
SOFFIT ELEVATION 13.5 m
1:1
2%±
1:1
5.5 m
PROPOSED STEPPED GABIONS (TYP)
PROPOSED MAINTENANCE ROAD
PROPOSED CUT–OFF WALL (TYP)
PROPOSED LOW–FLOW CHANNEL WITH ROCK LINING ELEV.= 6.0 m

B
–

SJIA ISLAND BRIDGE
STA 14+700

NTS

▨ PROPOSED EXCAVATION

▽ DESIGN WATER SURFACE

[NOT FOR CONSTRUCTION]

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

1. SECTION CUT LOOKING UPSTREAM.
2. BRIDGE DATA TAKEN FROM AS–BUILT AND RECORD DRAWINGS.

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112–4524
(408)436–4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04

DATE
AUG. 2001
DESIGN
MTR
DRAWN
MTR
CHECKED
EG

Santa Clara Valley Water District

ACCEPTED BY DISTRICT

DATE

PROJECT ENGINEER

LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT
STA 14+554 AND STA 14+700 BRIDGE SECTIONS

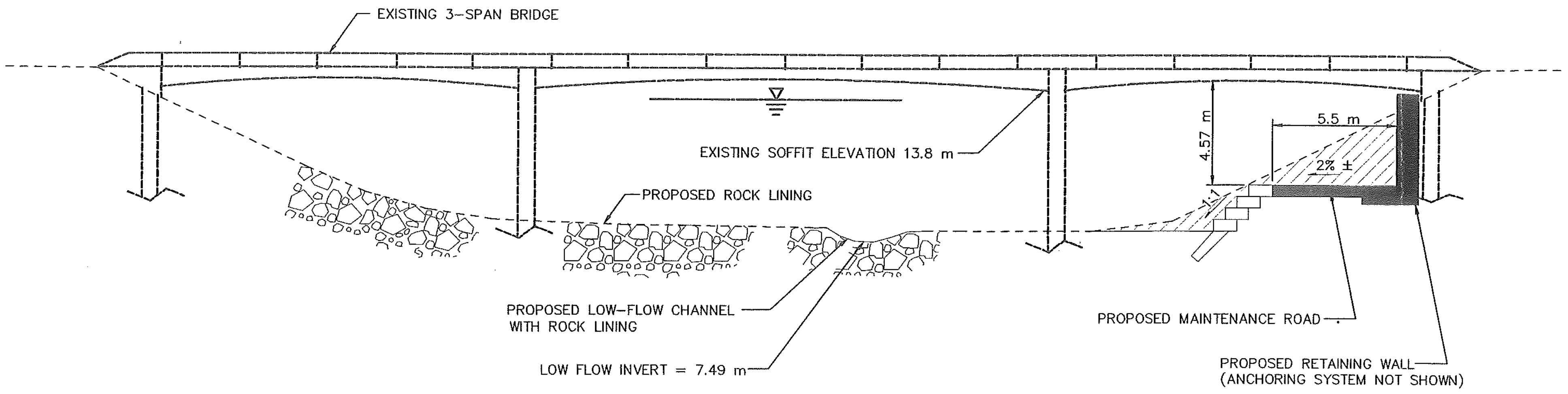
VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE
NTS

SHEET
37
37 OF 45

PROJECT: 153735
DWG NAME: Acad\Rprt\S37–RPT.dwg
X–REF(S): SC–BDR1,XSECTYP1

Metric


EXISTING 3-SPAN BRIDGE
4.57 m
5.5 m
2% ±
1:1
EXISTING SOFFIT ELEVATION 13.8 m
PROPOSED ROCK LINING
PROPOSED LOW-FLOW CHANNEL WITH ROCK LINING
LOW FLOW INVERT = 7.49 m
PROPOSED MAINTENANCE ROAD
PROPOSED RETAINING WALL (ANCHORING SYSTEM NOT SHOWN)

(A/–) AIRPORT PARKWAY BRIDGE
STA 15+695

NTS

[NOT FOR CONSTRUCTION]

▨ PROPOSED EXCAVATION

▽ DESIGN WATER SURFACE

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

1. SECTION CUT LOOKING UPSTREAM.
2. BRIDGE DATA TAKEN FROM AS-BUILT AND RECORD DRAWINGS.

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04

DATE AUG. 2001
DESIGN MTR
DRAWN MTR
CHECKED EG

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
PROJECT ENGINEER
DATE

LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT
STA 15+285
BRIDGE SECTION

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

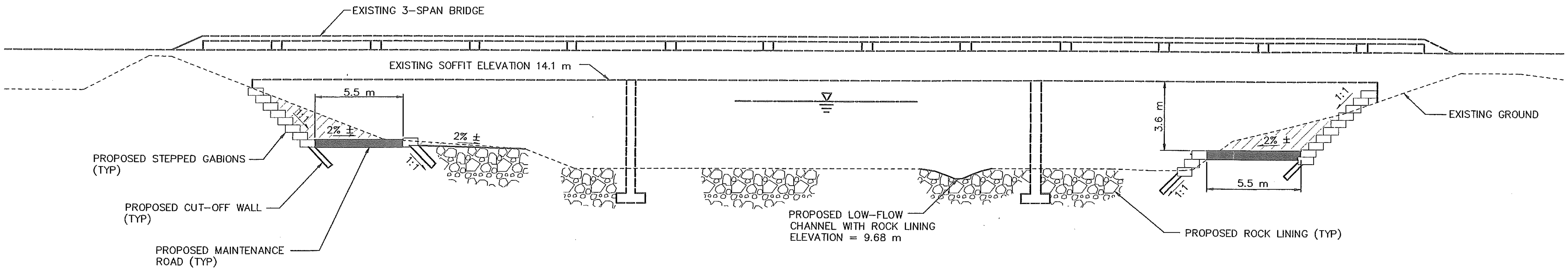
SCALE NTS

SHEET 38

38 OF 45

PROJECT: 153735
DWG NAME: Acad\Rprt\S38-RPT.dwg
X-REF(S): SC-BDR1,XSECTYP1

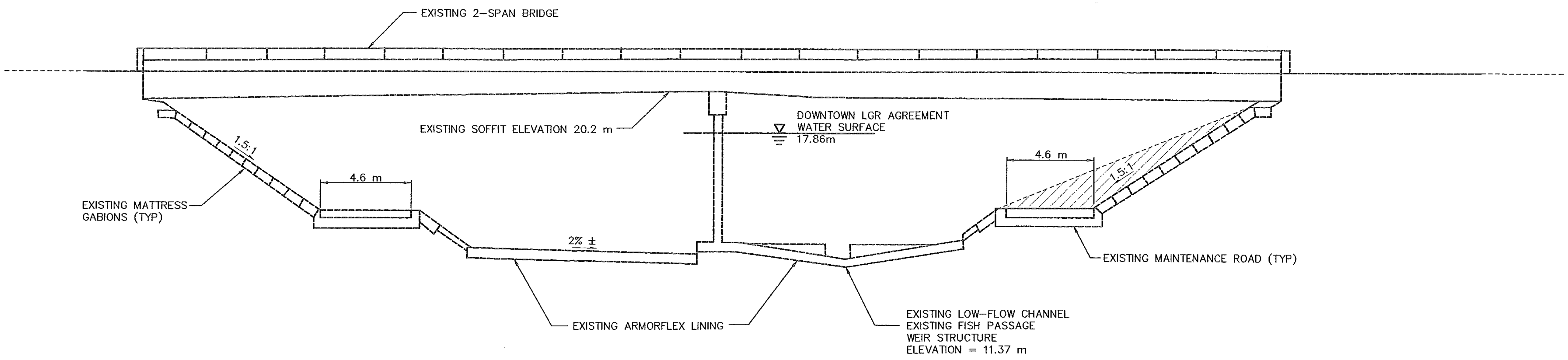
Metric



EXISTING 3-SPAN BRIDGE
EXISTING SOFFIT ELEVATION 14.1 m
5.5 m
2% ±
1:1
2% ±
1:1
3.6 m
1:1
2% ±
5.5 m
1:1
EXISTING GROUND
PROPOSED STEPPED GABIONS (TYP)
PROPOSED CUT-OFF WALL (TYP)
PROPOSED MAINTENANCE ROAD (TYP)
PROPOSED LOW-FLOW CHANNEL WITH ROCK LINING ELEVATION = 9.68 m
PROPOSED ROCK LINING (TYP)

Ⓐ SKYPORT DRIVE BRIDGE
STA 16+306

NTS



EXISTING 2-SPAN BRIDGE
EXISTING SOFFIT ELEVATION 20.2 m
DOWNTOWN LGR AGREEMENT WATER SURFACE 17.86m
1.5:1
4.6 m
4.6 m
1.5:1
EXISTING MATTRESS GABIONS (TYP)
2% ±
EXISTING MAINTENANCE ROAD (TYP)
EXISTING ARMORFLEX LINING
EXISTING LOW-FLOW CHANNEL
EXISTING FISH PASSAGE
WEIR STRUCTURE
ELEVATION = 11.37 m

Ⓑ HWY 880 BRIDGE
STA 17+648.50
END OF PROJECT

NTS

▨ PROPOSED EXCAVATION

▽ DESIGN WATER SURFACE

[NOT FOR CONSTRUCTION]

PROJECT: 153735
DWG NAME: Acad\Rprt\S39-RPT.dwg
X-REF(S): SC-BDR1,XSECTYP1

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

1. SECTION CUT LOOKING UPSTREAM.
2. BRIDGE DATA TAKEN FROM AS-BUILT AND RECORD DRAWINGS.

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04

DATE AUG. 2001
DESIGN MTR
DRAWN MTR
CHECKED EG

Santa Clara Valley Water District

ACCEPTED BY DISTRICT

DATE

PROJECT ENGINEER

LOWER GUADALUPE RIVER
FLOOD PROTECTION PROJECT
STA 16+306 AND STA 17+548.50
BRIDGE SECTIONS

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE NTS

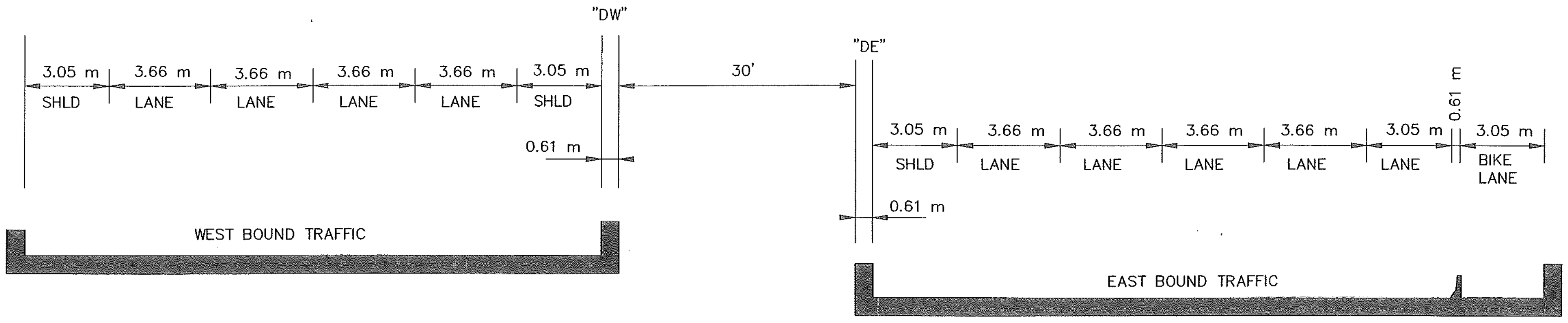
SHEET
39
39 OF 45

Metric

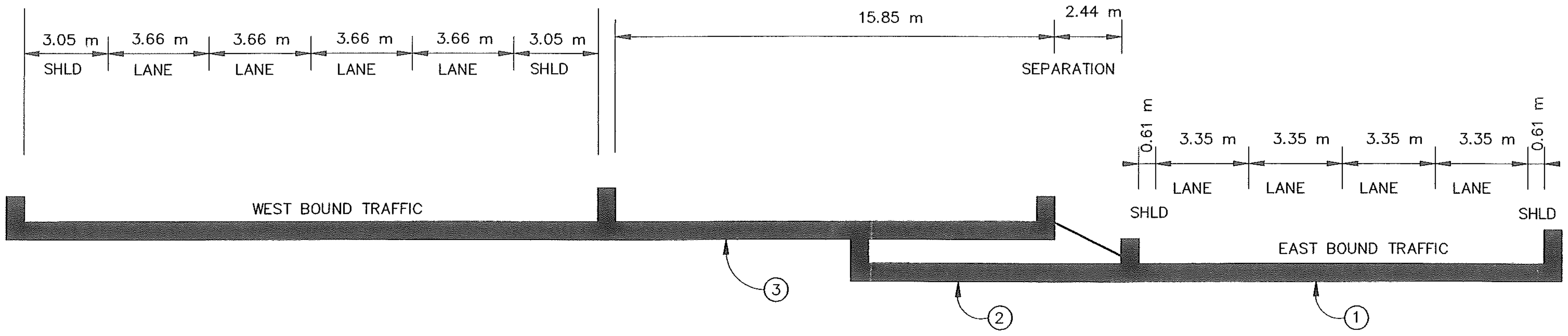
① SHIFT EAST BOUND TRAFFIC TO THE SOUTH

② DEMO EXIST NORTHERN SEGMENT OF BRIDGE

③ CONSTRUCT NEW BRIDGE ON THE NORTH
ADJUST TO WEST BOUND STRUCTURE



EXISTING



STAGE 1

[NOT FOR CONSTRUCTION]

PROJECT: 153735
DWG NAME: Acad\Rpt\S40-RPT.dwg
X-REF(S): Acad\Xrefs\SC-bdr1.dwg

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04

DATE AUG. 2001
DESIGN MTR
DRAWN MTR
CHECKED EG

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
PROJECT ENGINEER
DATE

LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT
237 BRIDGE REPLACEMENT
CONSTRUCTION STAGING PLAN
TYPICAL SECTIONS

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

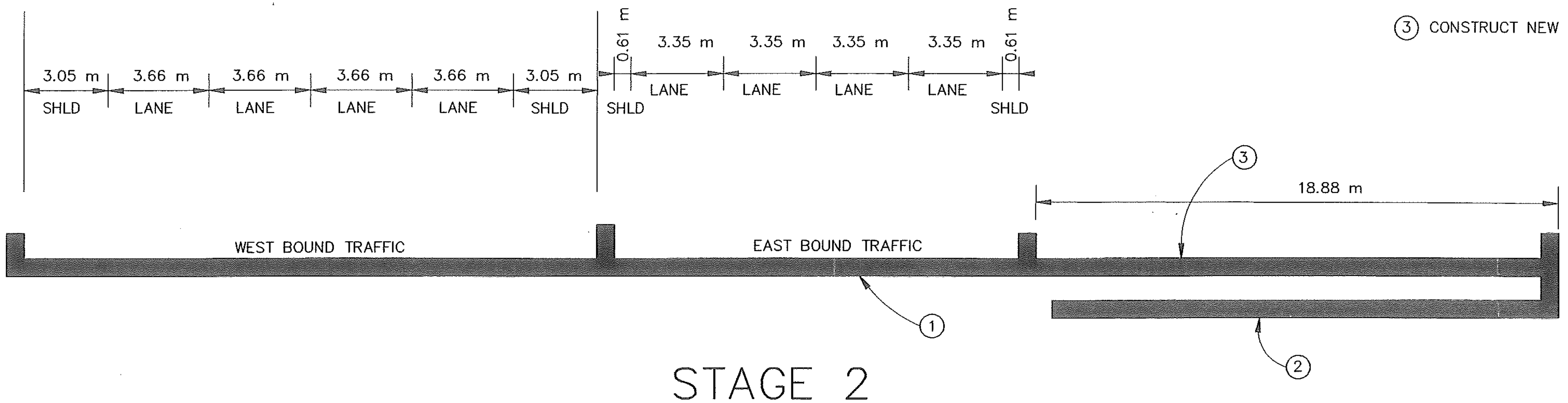
SCALE NTS
SHEET
40
40 OF 45

Metric

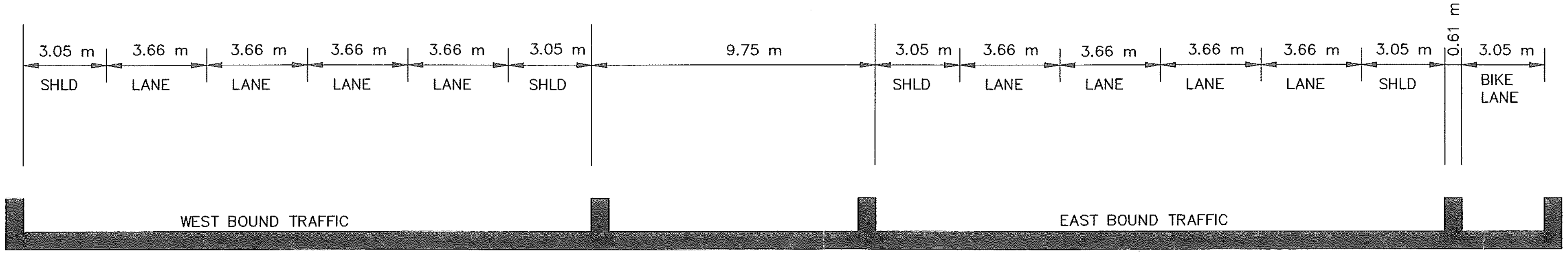
① SHIFT TRAFFIC TO THE NORTH

② DEMO EXIST SOUTHERN SEGMENT OF BRIDGE

③ CONSTRUCT NEW BRIDGE ON THE SOUTH



STAGE 2



FINISH

[NOT FOR CONSTRUCTION]

PROJECT: 153735
DWG NAME: Acad\Rprt\S41-RPT.dwg
X-REF(S): M2_BDR,XSECTYP1

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04
CIVIL

DATE AUG. 2001
DESIGN MTR
DRAWN MTR
CHECKED EG

Santa Clara Valley Water District

ACCEPTED BY DISTRICT

DATE

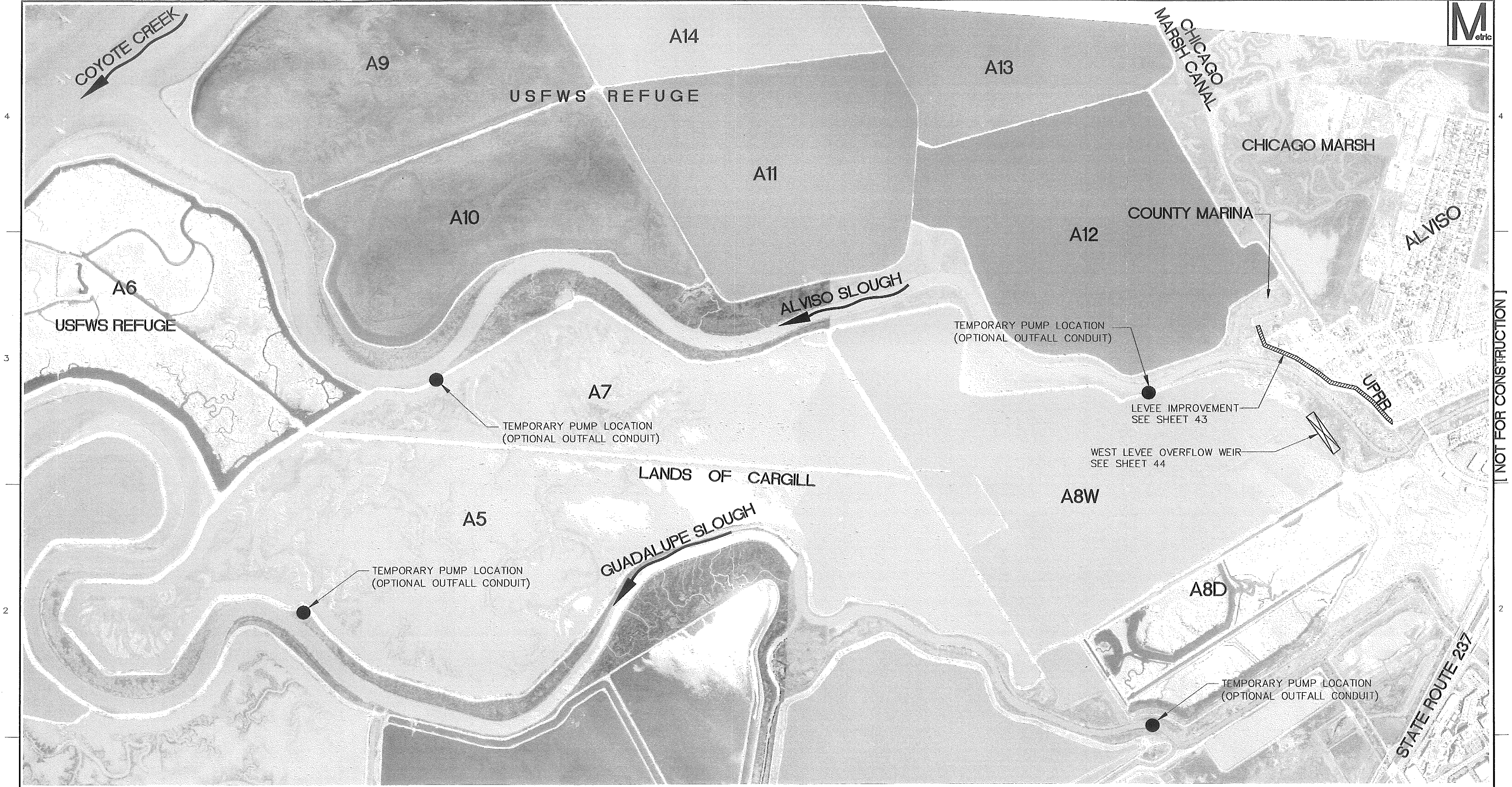
PROJECT ENGINEER

LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT
237 BRIDGE REPLACEMENT
CONSTRUCTION STAGING
TYPICAL SECTIONS

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING
IF NOT ADJUST SCALES ACCORDINGLY

SCALE NTS

SHEET
41
41 OF 45


COYOTE CREEK
A9
A14
A13
CHICAGO MARSH CANAL
USFWS REFUGE
CHICAGO MARSH
A11
A10
COUNTY MARINA
A12
ALVISO
A6
USFWS REFUGE
ALVISO SLOUGH
TEMPORARY PUMP LOCATION (OPTIONAL OUTFALL CONDUIT)
A7
TEMPORARY PUMP LOCATION (OPTIONAL OUTFALL CONDUIT)
LEVEE IMPROVEMENT SEE SHEET 43
UPRR
WEST LEVEE OVERFLOW WEIR SEE SHEET 44
LANDS OF CARGILL
A8W
A5
GUADALUPE SLOUGH
TEMPORARY PUMP LOCATION (OPTIONAL OUTFALL CONDUIT)
A8D
TEMPORARY PUMP LOCATION (OPTIONAL OUTFALL CONDUIT)
STATE ROUTE 237
200 100 0 500
SCALE IN METERS

Metric

[NOT FOR CONSTRUCTION]

LEGEND:

▨ LEVEE IMPROVEMENT LOCATION

● TEMPORARY PUMP LOCATION (OPTIONAL OUTFALL CONDUIT)

☒ LEVEE WEIR LOCATION

A5 POND DESIGNATION

PROJECT: 153735
DWG NAME: Acad\Rprt\S42-RPT.dwg
X-REF(S): Acad\Xrefs\baylnds.dwg

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04

DATE AUG. 2001
DESIGN J.A.M.
DRAWN J.A.M.
CHECKED D.V.R.

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
PROJECT ENGINEER
DATE

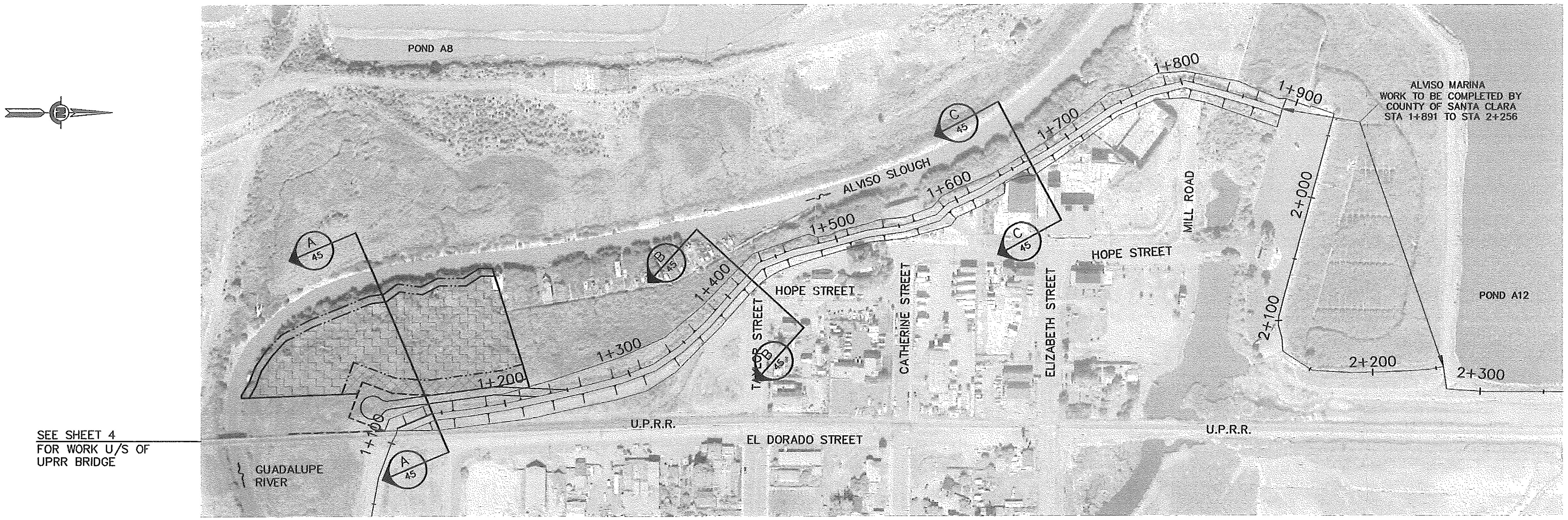
LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT
ALVISO BAYLANDS IMPROVEMENTS PLAN

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

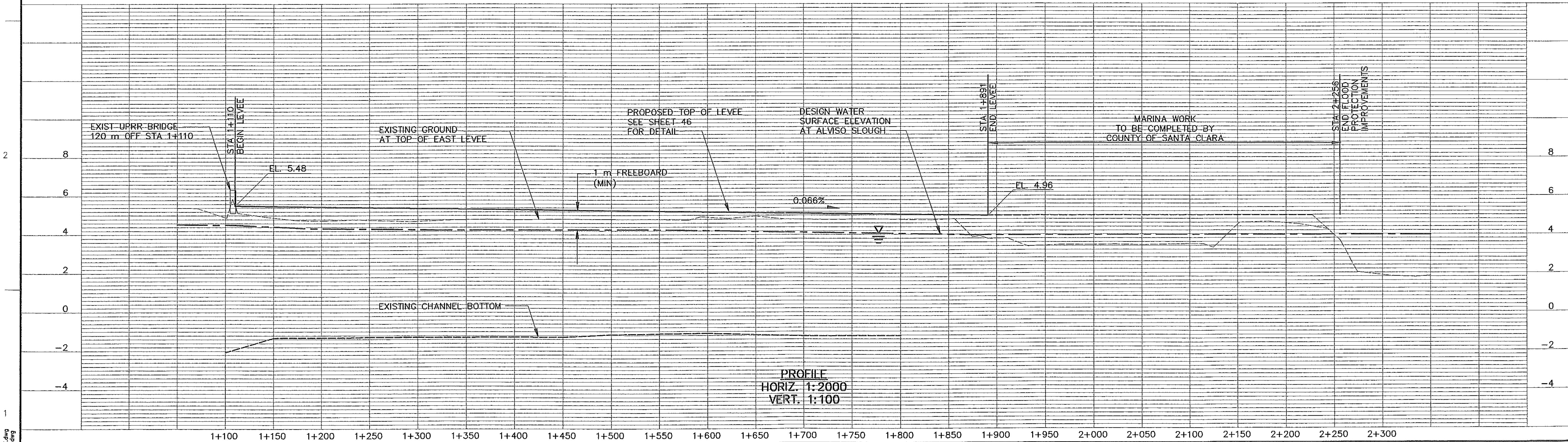
SCALE AS SHOWN

SHEET
42
42 OF 45

Metric



PLAN
SCALE 1:2000



PROFILE
HORIZ. 1:2000
VERT. 1:100

[NOT FOR CONSTRUCTION]

PROJECT: 153735
DWG NAME: Acad\Rprt\S46-RPT.dwg
X-REF(S): Acad\Xrefs\SC-bdr1.dwg

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04

DATE	AUG. 2001
DESIGN	MTR
DRAWN	MTR
CHECKED	DMV

Santa Clara Valley Water District

ACCEPTED BY DISTRICT

DATE

PROJECT ENGINEER

LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT

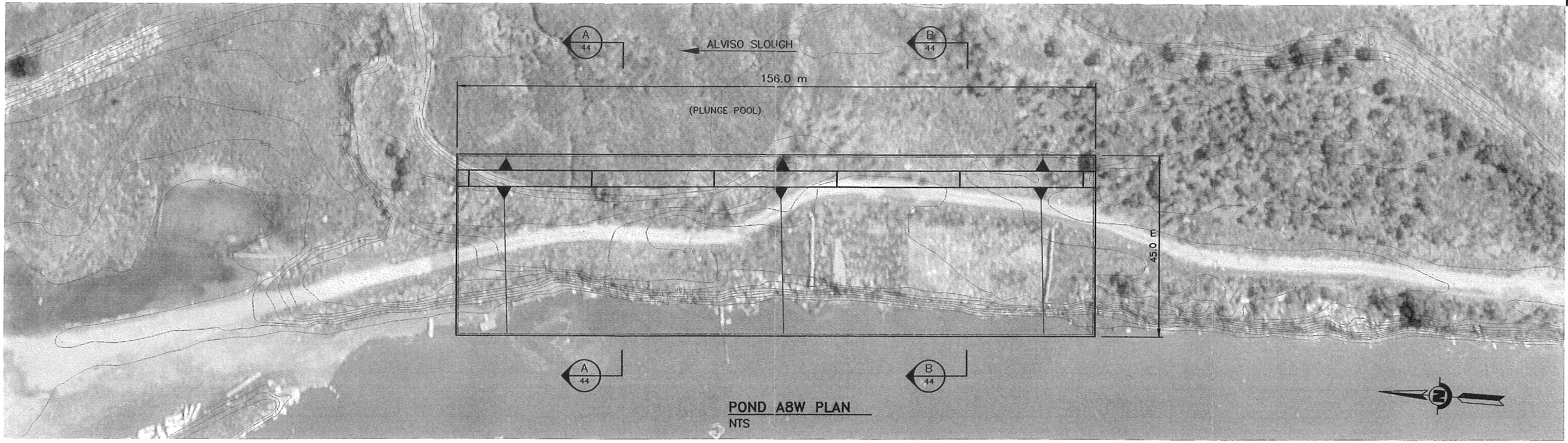
ALVISO SLOUGH LEVEE
PLAN AND PROFILE

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

SCALE
1:2000
1:100

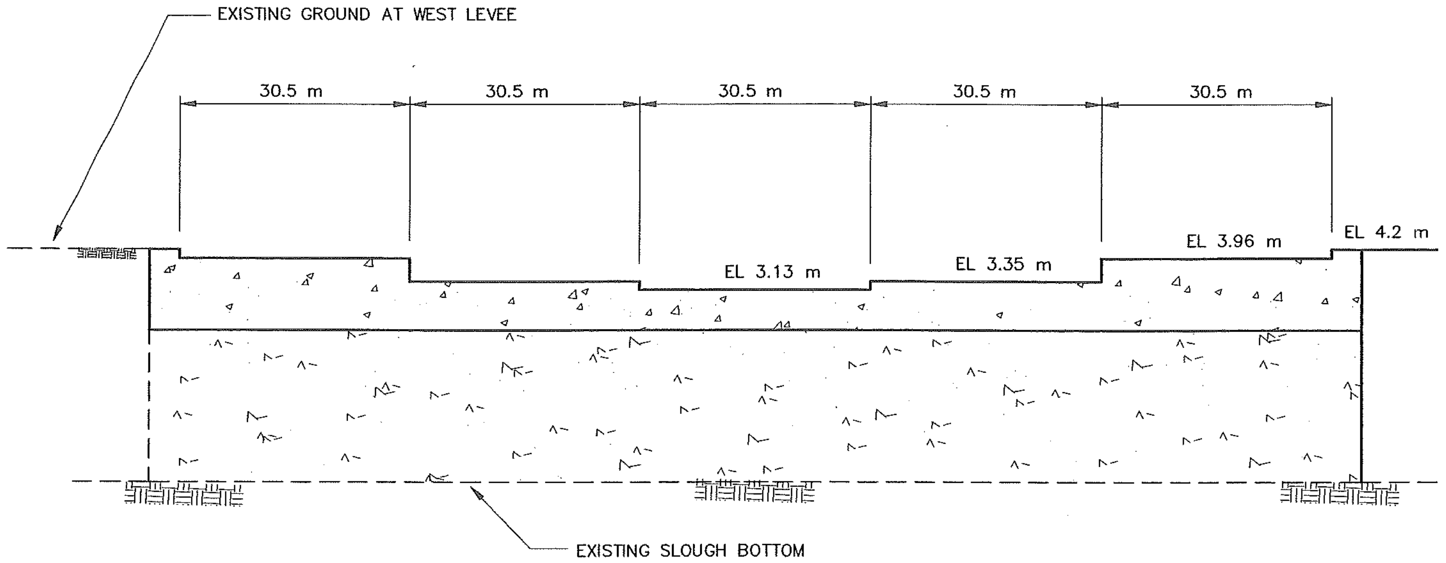
SHEET
43
43 OF 45

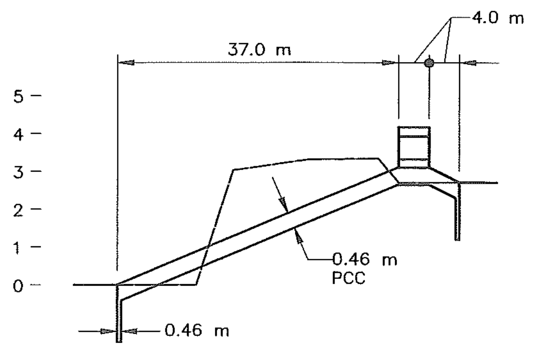
M etric

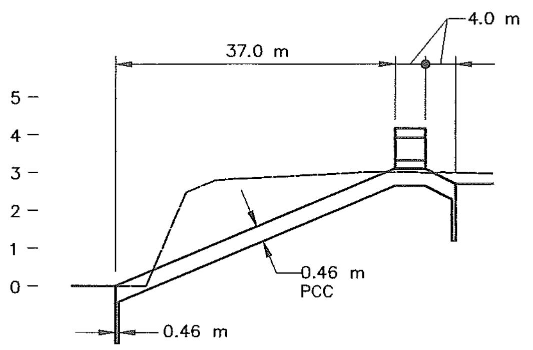


POND A8W PLAN
NTS

[NOT FOR CONSTRUCTION]







① DOWNFLOW WEIR
NTS

A/44 SECTION A–A
NTS

B/44 SECTION B–B
NTS

PROJECT: 153735
DWG NAME: Acad\Rprt\S44-RPT.dwg
X-REF(S): Acad\Xrefs\SC-bdr1.dwg

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

David Michael Von Rueden
RCE 26428
EXP. 03/31/04

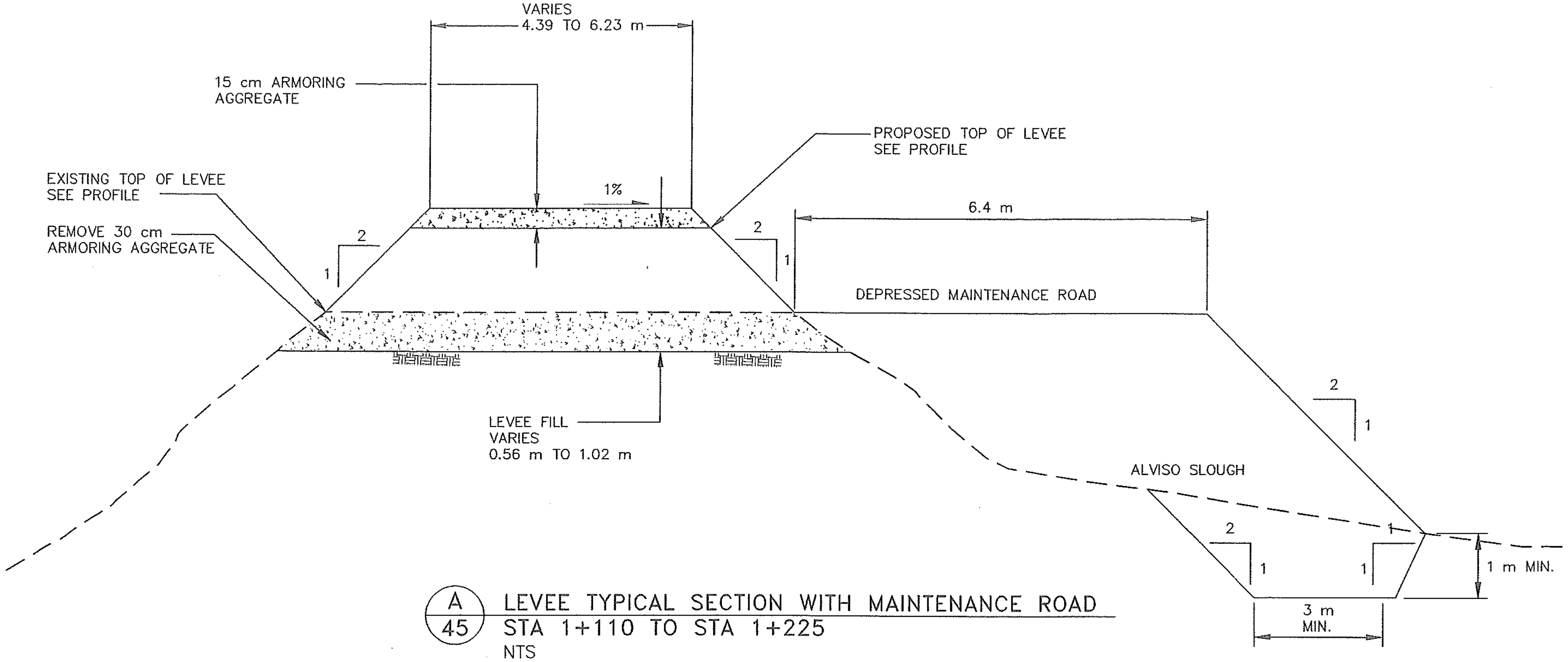
DATE AUG.2001
DESIGN JJ
DRAWN JAK
CHECKED D.V.R.

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
DATE
PROJECT ENGINEER

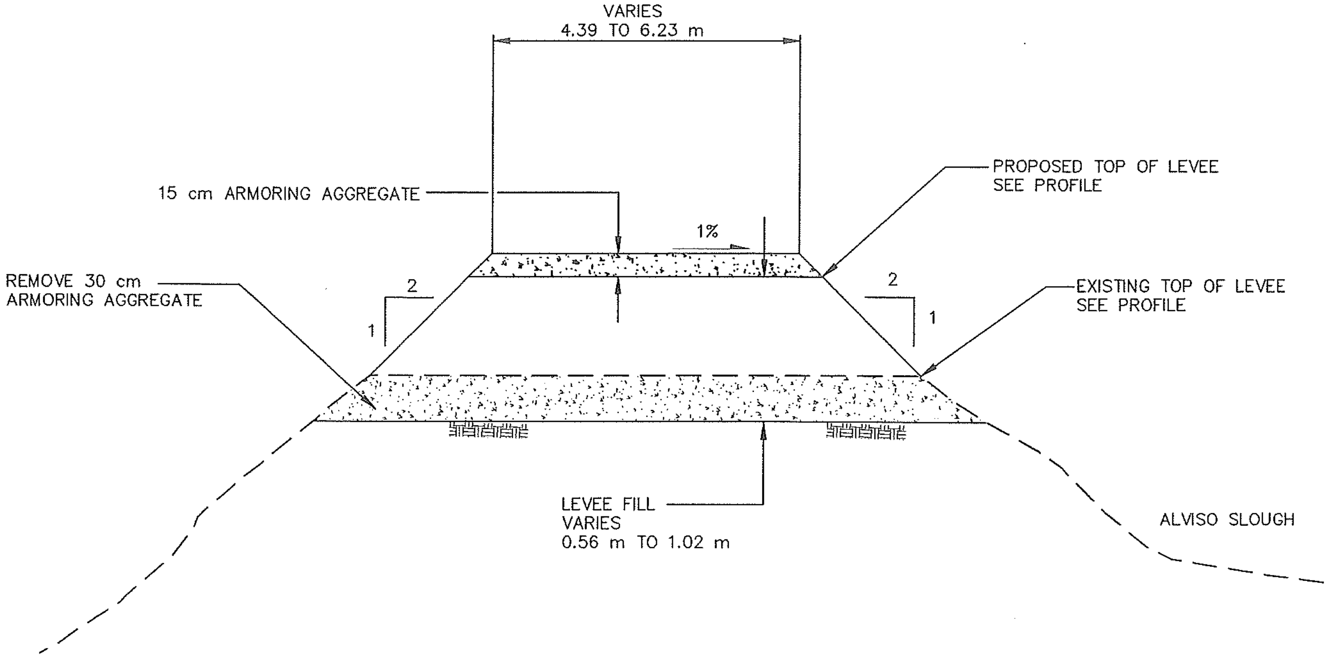
LOWER GUADALUPE RIVER
FLOOD PROTECTION PROJECT
WEST LEVEE OVERFLOW WEIR
PLAN AND SECTIONS

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

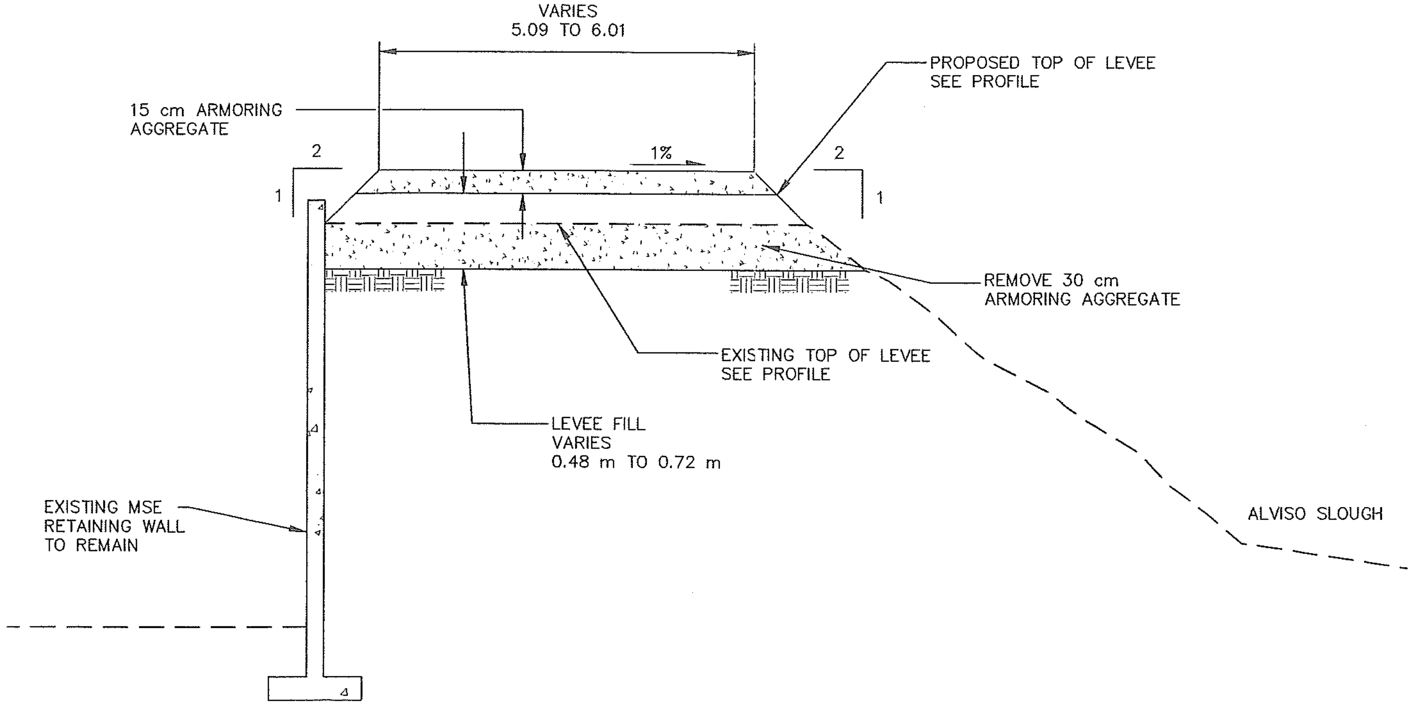
SCALE
AS SHOWN
V 1:50
SHEET
44
44 OF 45


VARIES
4.39 TO 6.23 m
15 cm ARMORING AGGREGATE
PROPOSED TOP OF LEVEE SEE PROFILE
EXISTING TOP OF LEVEE SEE PROFILE
REMOVE 30 cm ARMORING AGGREGATE
1%
2
1
6.4 m
DEPRESSED MAINTENANCE ROAD
LEVEE FILL VARIES 0.56 m TO 1.02 m
ALVISO SLOUGH
1 m MIN.
3 m MIN.

A/45 LEVEE TYPICAL SECTION WITH MAINTENANCE ROAD
STA 1+110 TO STA 1+225
NTS


VARIES
4.39 TO 6.23 m
15 cm ARMORING AGGREGATE
PROPOSED TOP OF LEVEE SEE PROFILE
1%
REMOVE 30 cm ARMORING AGGREGATE
2
1
EXISTING TOP OF LEVEE SEE PROFILE
LEVEE FILL VARIES 0.56 m TO 1.02 m
ALVISO SLOUGH

B/45 LEVEE TYPICAL SECTION
STA 1+422
NTS


VARIES
5.09 TO 6.01
PROPOSED TOP OF LEVEE SEE PROFILE
15 cm ARMORING AGGREGATE
2
1
1%
REMOVE 30 cm ARMORING AGGREGATE
EXISTING TOP OF LEVEE SEE PROFILE
LEVEE FILL VARIES 0.48 m TO 0.72 m
EXISTING MSE RETAINING WALL TO REMAIN
ALVISO SLOUGH

C/45 LEVEE TYPICAL SECTION W/ RETAINING WALL
STA 1+665
NTS

[NOT FOR CONSTRUCTION]

Metric

PROJECT: 153735
DWG NAME: Acad\Rprt\S45-RPT.dwg
X-REF(S): Acad\Xrefs\SC-bdr1.dwg

REV	DESCRIPTION	DATE	APPR

REFERENCE INFORMATION AND NOTES

CH2MHILL
1737 NORTH FIRST STREET, SUITE 300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909

REGISTERED PROFESSIONAL ENGINEER
David Michael Von Ruden
RCE 26428
EXP. 03/31/04
CIVIL
STATE OF CALIFORNIA

DATE AUG. 2001
DESIGN J.A.M.
DRAWN J.A.M.
CHECKED D.V.R.

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
DATE
PROJECT ENGINEER

LOWER GUADALUPE RIVER FLOOD PROTECTION PROJECT
ALVISO BAYLANDS IMPROVEMENTS DETAILS

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING
IF NOT ADJUST SCALES ACCORDINGLY

SCALE AS SHOWN
SHEET
45
45 OF 45

Santa Clara Valley Water District